DOCUMENT RESUME

ED 282 060 CE 047 273

AUTHOR Nord, Roy D.; And Others
TITLE Propensity and the Enlistment Decision. Technical Report 723.
INSTITUTION Army Research Inst. for the Behavioral and Social Sciences, Alexandria, Va.
PUB DATE Aug 86
NOTE 92p.
PUB TYPE Reports - Research/Technical (143)

EDRS PRICE MF01/PC04 Plus Postage.
DESCRIPTORS Adult Education; *Armed Forces; Career Education; Enlisted Personnel; *Expectation; Goal Orientation; *Individual Characteristics; Military Service; *Prediction; *Probability; *Student Educational Objectives
IDENTIFIERS *Military Enlistment

ABSTRACT

Enlistment intentions, educational expectations, and sociodemographic factors were examined in the context of their pairwise relationship to the enlistment decision. A model was developed relating enlistments to stated intentions and other variables. This model was then statistically estimated from a sample from the National Longitudinal Survey. Logistic regression was used to predict enlistments from information on intentions and backgrounds. Findings indicated that enlistees in the armed forces experienced an increase in educational expectations not reflected in the general population. A considerable shift was found among enlistees with respect to original enlistment intentions. Enlistment intentions or propensity was the strongest explanatory factor in predicting enlistment. Such factors as educational intentions, race, gender, and test score also contributed substantially (and independently of propensity) to explaining enlistment behavior. A positive change in propensity over time had a positive effect on enlistment probability above and beyond the effect of propensity measured at a single point in time. The effect of Armed Forces Qualification Test (AFQT) scores on the probability of enlistment was positive, but the size of this effect diminished as AFQT increased. A desire for training beyond high school but outside of college was a good predictor of enlistment probability. (This report includes 36 figures illustrating study findings.) (YLB)

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Technical Report 723

Propensity and the Enlistment Decision

Roy D. Nord, Edward J. Schmitz, and Thomas A. Weiland

Manpower and Personnel Policy Research Group

Manpower and Personnel Research Laboratory

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REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER ARI Technical Report 723	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) PROPENSITY AND THE ENLISTMENT DECISION		5. TYPE OF REPORT & PERIOD COVERED Final Report October 1985-July 1986
		6. PERFORMING ORG. REPORT NUMBER --
7. AUTHOR(s) Roy D. Nord, Edward J. Schmitz, and Thomas A. Weiland		8. CONTRACT OR GRANT NUMBER(s) --
9. PERFORMING ORGANIZATION NAME AND ADDRESS U.S. Army Research Institute for the Behavioral and Social Sciences 5001 Eisenhower Ave., Alexandria, VA 22333-5600		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS 2Q263731A792 211
11. CONTROLLING OFFICE NAME AND ADDRESS U.S. Army Research Institute for the Behavioral and Social Sciences 5001 Eisenhower Ave., Alexandria, VA 22333-5600		12. REPORT DATE August 1986 13. NUMBER OF PAGES 70
14. MONITORING AGENCY NAME & ADDRESS(if different from Controlling Office) --		15. SECURITY CLASS. (of this report) Unclassified 15a. DECLASSIFICATION/DOWNGRADING SCHEDULE --
16. DISTRIBUTION STATEMENT (of this Report) Approved for public release; distribution unlimited.		
17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report) --		
18. SUPPLEMENTARY NOTES --		
19. KEY WORDS (Continue on reverse side if necessary and identify by block number) Propensity Enlistment Expectations National Longitudinal Survey Logistic regression Intentions Probability of enlistment		
20. ABSTRACT (Continue on reverse side if necessary and identify by block number) This research examined the relationship between actual military enlistments and enlistment intentions, educational expectations, and other factors. A number of factors, including enlistment intentions, were found to predict enlistment behavior. Projected enlistment rates, given changes in significant factors, are reported.		

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Technical Report 723

Propensity and the Enlistment Decision

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August 1986

Army Project Number
2Q263731A792

Manpower and Personnel

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FOREWORD

The Manpower and Personnel Policy Research Group of the U.S. Army Research Institute for the Behavioral and Social Sciences is concerned with understanding the effect of social, demographic, and policy factors on Army enlistments. This research examines how various behavioral factors can explain enlistment behavior. The results will enable the Army to better assess the effectiveness of recruiting policies and improve the allocation of resources.

EDGAR M. JOHNSON
Technical Director

ACKNOWLEDGMENTS

We gratefully acknowledge the efforts of other rsearchers in the Manpower and Personnel Policy Research Group of the Army Research Institute for aiding in the preparation of this report. The assistance of Cavan Capps, Donald Cox, and Sidney Sachs was particularly helpful to our effort.

PROPENSITY AND THE ENLISTMENT DECISION

EXECUTIVE SUMMARY

Requirement:

To explain the extent to which individuals' stated propensity to enlist can improve understanding of the decision to enlist.

Procedure:

Enlistment intentions, educational expectations, and socio-demographic factors were examined in the context of their pairwise relationship to the enlistment decision. A model was then developed relating enlistments to stated intentions and other variables. This model was then statistically estimated from a sample from the National Longitudinal Survey. Logistic regression was used to predict enlistments from information on intentions and backgrounds.

Findings:

- Individuals enlisting in the military experienced an increase in educational expectations that was not reflected in the general population.
- There is a considerable shift among enlistees with respect to original service enlistment intentions. Most Navy enlistees initially planned to join the Air Force, while most Army recruits intended to join the Navy 3 years prior to enlisting.
- Enlistment intentions or propensity was the strongest explanatory factor in predicting enlistment.
- Many other factors, such as educational intentions, race, gender, and test scores, also contributed substantially (and independently of propensity) to explaining enlistment behavior.
- A positive change in propensity over time has a positive effect on enlistment probability above and beyond the effect of propensity measured at a single point in time.
- The effect of AFQT scores on the probability of enlistment is positive, but the size of this effect diminishes as AFQT increases.
- A desire for training beyond high school but outside of college is a good predictor of enlistment probability.

Utilization of Findings:

The information in this report can be used to aid efforts in recruiting, advertising, and general marketing of the military.

PROPENSITY AND THE ENLISTMENT DECISION

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INTRODUCTION

Survey intention information is widely used to develop, plan, and evaluate marketing strategies in the private sector. The military uses similar information from the Youth Attitude tracking Survey (YATS) and the National Longitudinal Survey (NLS) to assess the enlistment intentions of the recruiting market. These surveys are used to indicate recruiting difficulties, assess the impact of advertising and marketing programs, and allocate resources geographically and among the services.

One important policy issue is how well does propensity actually relate to enlistment. One would like to know how accurately propensity predicts enlistment, whether other factors independently contribute to explaining enlistments, and whether there is a dynamic relationship between propensity and enlistment.

This paper uses data from the National Longitudinal Survey (NLS) to analyze the links between stated propensity, other explanatory variables, and the enlistment decision. In the next section, related research, data sources for investigating propensity, and an initial bivariate analyses are described. The Methodology and Results section presents both the model we use to investigate the enlistment decision and its parameter estimates. The final section provides conclusions and discussion based upon this research.

BACKGROUND

Related Research

The enlistment decision has been hypothesized to be related to a number of alternative factors. Aggregate economic models such as Brown's pooled time series/cross-sectional data (1985) have shown that rising unemployment rates and higher relative military wages are associated with increased enlistments. Cox (1986) has shown that, at the individual level, race and desire for additional job training (a type of intention data) are associated with higher enlistment probabilities.

The use of intention data is a common practice throughout marketing. It provides market researchers with quick and inexpensive information on the desirability or acceptance of a particular product. Consequently, such data are used to evaluate new products, market segmentation, and test advertising. However, an important research issue in marketing science is how well one can predict actual purchasing decisions from such hypothetical data. Morrison (1979) points out that there has been little follow-up of individuals to find out if those surveyed actually behaved as they intended. Kalwani and Silk (1982) surveyed several studies where there was follow-up data collected and found that durable goods exhibit a linear relationship between intentions and purchases, while branded packaged goods display a threshold effect.

The military measures intentions through similar questions from two surveys- the YATS (Youth Attitude Tracking Survey) and the NLS (National Longitudinal Survey). The question asks how likely the youth is to enlist. The four possible responses are "very likely", "somewhat likely", "somewhat unlikely", and "very unlikely". Thus, a youth is defined to have a positive propensity to enlist if his response is in one of the first two categories. In addition to this question, the YATS has an open-ended "unaided mention" question, about what the youth intends to be doing in the next few years. If the youth answers that he or she intends to enlist, he or she is considered to exhibit unaided mention of enlistment.

Comprehensive recent studies of propensity to enlist and its links to the enlistment decision have been carried out by researchers at the Rand Corporation. Orvis (1982) and Orvis and Gahart (1985) explored these links using data from Armed Forces Vocational Aptitude Battery (ASVAB), Military Enlistment Processing Command (MEPCOM) records, along with survey data from the YATS and the NLS. The main thrust of this work concerned the relationship of inten-

tion to enlist (often called propensity to enlist) and actual enlistment behavior. They also explored the question of how the effect of stated intentions on subsequent behavior changes with the passage of time.

In addition to questions on propensity, Orvis and Gahart included demographic, attitudinal, and economic variables in his analysis. Among the results are:

- The standard measure of enlistment propensity, stated intentions, is a statistically significant predictor of actual enlistment. Those who are "very likely" to enlist are indeed most likely to enlist. This trend also holds true for the "somewhat likely", "somewhat unlikely", and "very unlikely" groups.
- High-quality, positive propensity applicants are more likely to enlist than lower-quality, positive propensity applicants. This is at least partially due to policies that discourage enlistments among low-quality applicants.
- Those who exhibit unaided mention of enlistment (a separate question on YATS but not on NLS), in addition to a positive propensity on the categorical scale, are more likely to enlist than those who only show a positive propensity on the categorical scale.
- One half of all accessions come from individuals with negative propensity.
- Wages are negatively correlated with enlistment.
- There are lagged effects of propensity on enlistment probability. The effect of a stated intention to enlist on enlistment behavior tends to increase rapidly immediately after the statement is made and then level off after 12-18 months.
- Those who exhibit unaided mention and also intend to join the Army have a greater chance of actually enlisting in the Army.

These studies have been very valuable in relating personal characteristics and intentions to actual enlistments. However, this research suffers from several limitations. These analyses relied upon contingency table analysis of the pairwise relationships between enlistment decisions, propensity, and various characteristics. While this approach is sufficient to produce roughly accurate estimates of the significance of the variables examined, it is less reliable as a means of comparing the magnitudes of effects. Alternatives include logit or probit models (Amemiya, 1981).

One important issue addressed only partially in Orvis' work is the analysis of the effects of the explanatory variables over time. This is difficult to do with YATS data, which uses only cross-sectional samples. This limits the ability to explore the effects of time-dependent characteristics, such as educational expectations, on either propensity or enlistment. In the analysis of NLS data, Orvis examined the cumulative effect over time of propensity, but did not look at the effect of *changes* in either propensity or other explanatory variables.

In an earlier paper, Nord and Weiland (1985) examined the determinants of propensity as well as the relationship between propensity and enlistment. Using logit regression on three years of NLS data (1979-1981), they found the following results:

- Non-high-school graduates have higher enlistment propensities than graduates.
- Youths scoring below average on the Armed Forces Qualification Test (AFQT) have higher enlistment propensities than those scoring higher.
- Males have higher enlistment propensities than females.
- Blacks and Hispanics have higher enlistment propensities than Whites.
- Of those who have positive propensities to enlist in the military, only a small percentage, when compared to the proportion of actual service enlistments, have a positive propensity to join the Army as a first choice of services.
- Youths who state a strong positive intention to enlist are substantially more likely to enlist than others.
- Youths who state a weak positive intention to enlist are more likely to enlist than those who state a negative intention.
- Youths who have recruiter contact while still in high school are more likely to enlist than those who do not.

This analysis can be extended in two ways: first, by examining the effects of changes in propensity and other variables on subsequent enlistment decisions, and second, by exploring whether or not the effect of AFQT is constant over its entire range. Also the development of alternative specifications of the links among individual characteristics, economic conditions, stated intentions, and the enlistment decision need to be explored.

Data

The data for this analysis was taken from the National Longitudinal Survey of Labor Force Experience, Profile of American Youth sub-sample. The NLS follows a sample of 12,686 youths, aged 14-22 in 1979, over time. The data used in this analysis include observations for the years 1979 to 1983.

We examined non-prior-service (NPS) enlistments for the years 1980-1983. There were 655 NPS accessions (about 5% of the NLS) over the four years of NLS data. Attitudinal, behavioral, socio-demographic, familial, educational, and economic variables were used. (See Appendix A).

The links among stated intentions, the enlistment decision, and a wide array of potential explanatory variables were explored using both bivariate and multivariate models. Table 1 provides a list of the variables examined.

The AFQT test for the NLS sample was administered in 1980, when the sample population was aged 15-23. There are significant variations in age-specific mean AFQT scores within this range. Thus, to avoid confounding the effects of age with those of AFQT in our analyses, we "renormed" AFQT scores so that the distribution of scores within each annual cohort was the same (50th percentile was used as the standard). Table 2 presents these AFQT scores. Raw mean score refers to the mean observed in each age group, while weighted mean utilizes sample weights, and adjusted mean both adjusts for sample weights and normalizes scores, with a mean of 50.

Age 17 was used as the reference year for desired and expected education, and propensity. With respect to educational attainment, individuals were classified as high school diploma graduates (HSDG) if they received a diploma any time prior to 1983.

To examine the effects of the explanatory variables over time, we constructed a set of relative-time-specific variables. This was done by defining a t_0 for each respondent and then redefining time-specific variables in terms of that point. For enlistees, t_0 was the year of enlistment. For non-enlistees, the reference year was the year the respondent turned 18. Because the reference year is not constant within the NLS, the sample sizes decrease somewhat as the relative-year increases or decreases. The mean age for enlistees at t_0 is approximately eighteen-and-one-half. Since we are interested in predicting behavior, the relative-year of interest is t_{-1}. Thus, all of the variables studied concern a 17 year-old.

Table 1
Variables Hypothesized to be Related to the Enlistment Decision

Variable	Description
Expectation to enter the military	Stated intention by year
Branch of the military expected to enter	First choice, by year, for respondents expressing positive intention
Actual entry into the military	Entry by year
Branch of the military entered	Branch by year
Sex	Gender
Age	Age in years
Parental education	Highest year of education completed
Parental occupation	Dictionary of Occupational Titles (DOT) code
Ethnicity	Self reported primary ethnicity
Race	Self reported race
Dependency status	Dependency on parents
Marital Status	Latest marital status
Type of last school attended	General, Vocational, Technical, Academic
Pay and payperiod	Dollars per period and period unit
Desired and expected future schooling	Schooling in years
Incentives for enlistment (bonus)	Dollars received, enlistees only
Satisfaction with present income	4-point scale
Savings (binary variable)	1 if savings > 0
Talked to military/army recruiter	By year
Family income	Dollars per year
Relatives in military	Number of family members with military experience
Expectation of whether military or civilian sector provides more income	binary
AFQT percentile	Normed on 1980 population
Desire to acquire additional training	Training outside of college
Local unemployment rates	Rates in percents

Table 2 AFQT Adjustments				
AGE	FREQ	RAW MEAN	WEIGHTED MEAN	ADJUSTED MEAN
15	950	34.4	39.0	50.5
16	1563	35.6	42.0	50.5
17	1562	37.2	43.2	50.5
18	1484	39.3	45.3	50.5
19	1504	39.5	47.3	50.5
20	1362	40.5	47.7	50.5
21	1263	43.7	50.9	50.5
22	1240	43.8	51.0	50.5

Bivariate Analysis

To begin study of the data, we analyzed simple relationships between propensity, enlistment, and a number of other variables estimated two at a time. These results are graphically depicted in Figures 1 - 16. Most of these graphics show trends over time, as opposed to simple differences at one point in time.

Figure 1 shows the percent of military enlistees who enlisted in each year of the NLS survey. Nearly 30 percent of the enlistments occurred in 1981.

Figure 2 shows the age at which individuals in the military sample enlisted. The majority of enlistees were either 18 or 19 years old.

Figure 3 illustrates educational desires of various groups of the data set over time. This desire represents the amount of total lifetime education that each individual (possibly unrealistically) wants. This graph, showing the percent of each group desiring at least 2 years of college, begins at T_{-3} (three years before the enlistment-relative year), and ends at T_{+2} (two years after). The enlistment-relative year is shown in darker color. All groups enlisting in the military experience a substantial rise in expectations during the enlistment year, while non-enlistees' expectations remain constant.

Figure 4 shows educational expectations over time. This graph is similar to the previous graph, but represents each individual's realistic expectation of total lifetime education. All military enlistment groups except the Navy show rising expectations during the enlistment year, while the non-enlistees do not.

Figure 5 parallels the above graph, but shows the percent of each group expecting at least 4 years of education.

Figure 6 indicates the expectation of enlistment (propensity to enlist) of non-enlistees over time. This represents expectations from age 14 to 17.

Figure 7 parallels the above graph, but indicates the propensities of military enlistees for the four years prior to actual enlistment. Positive propensities increase in each year prior to enlistment. However, over one third of enlistees exhibit negative propensities prior to enlisting.

Figure 8 breaks out Army enlistees from the military sample for enlistment propensities. Patterns are generally similar to those in Figure 7.

Figure 9 breaks out Navy enlistees from the military sample for enlistment propensities. Navy enlistees do not generally exhibit rising propensities. In fact, the "very unlikely to enlist" category increases each year prior to enlistment.

Figure 10 breaks out Air Force enlistees from the military sample for enlistment propensities. No particular patterns are apparent.

Figure 11 indicates which branch of the military that the military enlistees actually joined. (The Other group includes Marines, all branches of the Guard, and all branches of the Reserves–these samples were combined due to the small size of each group.)

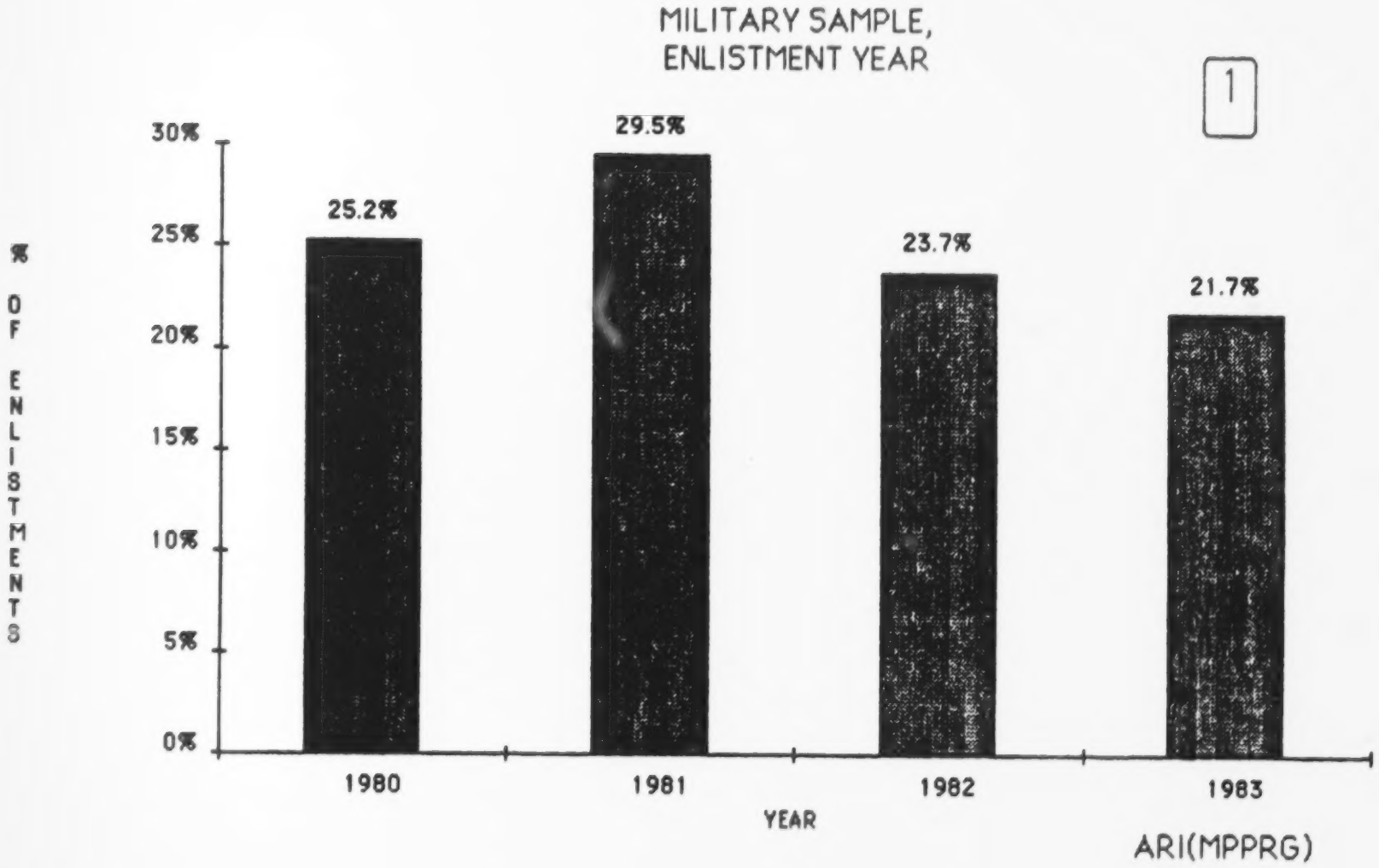
Figure 12 shows which branch of the military that the non-enlistees expected to join (for those who actually expected to join the military). This represents their expectations from age 14 to age 17. The greatest proportion expected to join the Air Force in each year.

Figure 13 parallels the previous graph, but indicates the military branch which the actual military enlistees expected to join for the four years prior to inlisting. Those expecting to join the Army increased each year, while those expecting to enlist in the Navy declined.

Figure 14 breaks out Army enlistees from the military sample for expected branch to join. Interestingly, four years prior to enlisting, nearly half of Army recruits expected to join the Navy.

Figure 15 breaks out Navy enlistees from the military sample for expected branch to join. Many Navy enlistees originally planned to join the Air Force.

Figure 16 breaks out Air Force enlistees from the military sample for expected branch to join. Unlike the Army and Navy, Air Force recruits never exhibited a strong propensity for any service other than the Air Force.


MILITARY SAMPLE,
ENLISTMENT YEAR
1
30%
25%
20%
15%
10%
5%
0%
25.2%
29.5%
23.7%
21.7%
1980
1981
1982
1983
YEAR
% OF ENLISTMENTS
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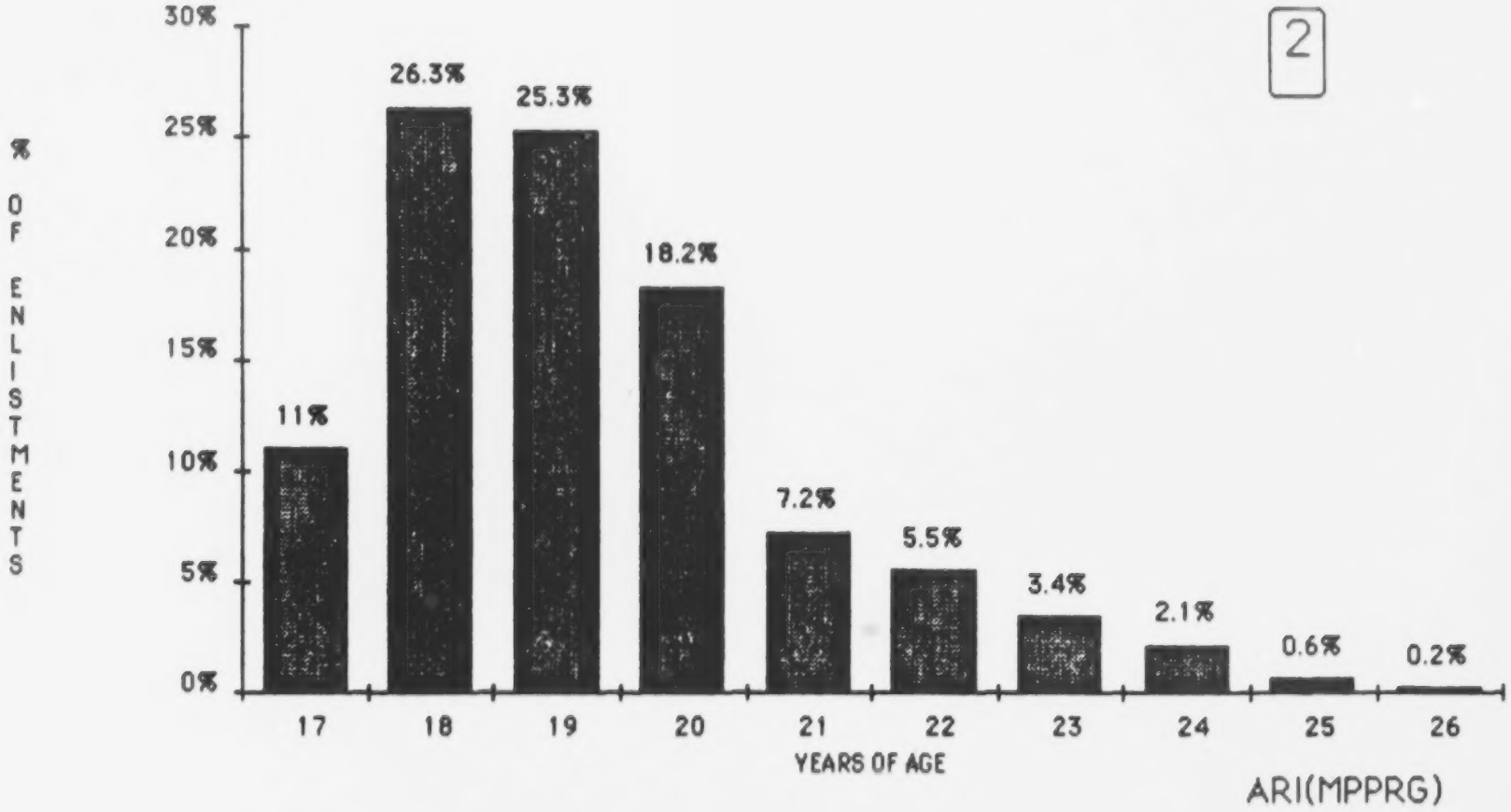
MILITARY SAMPLE, AGE AT ENLISTMENT

2



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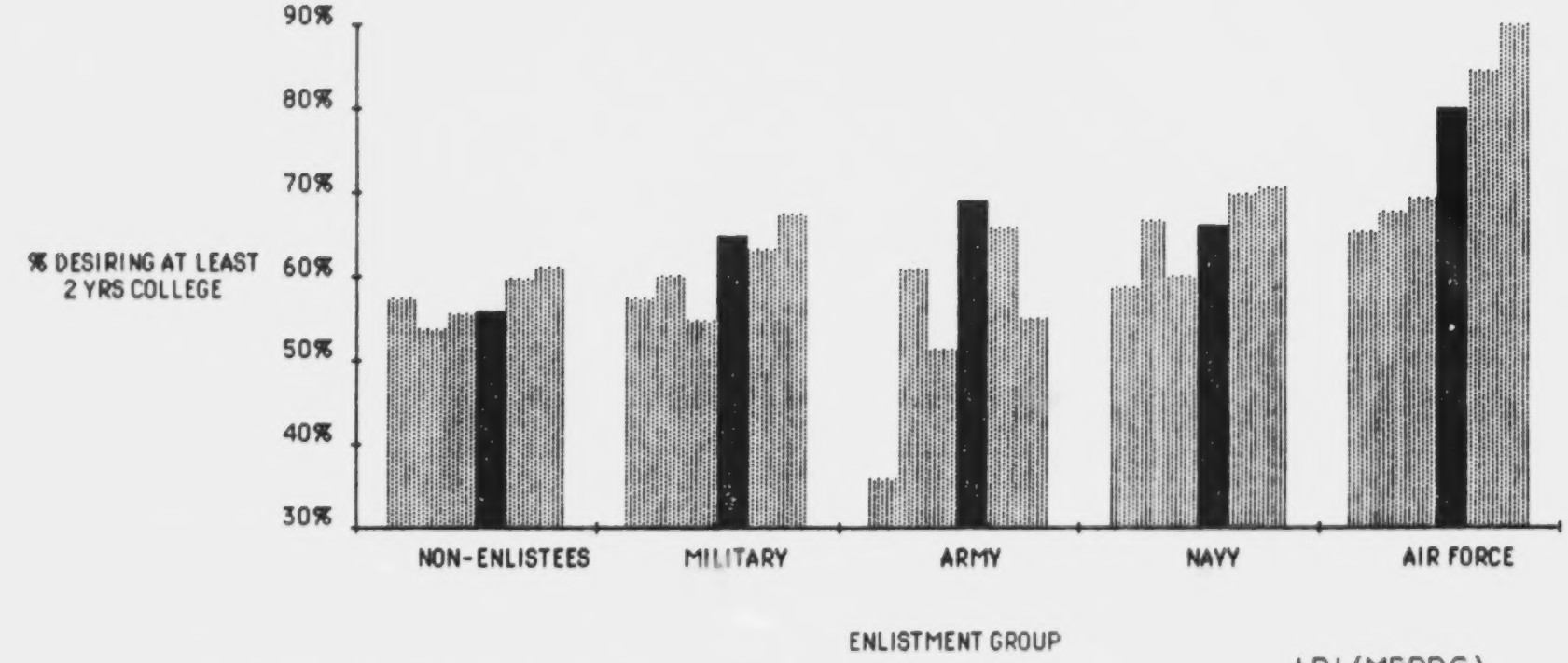
ALL GROUPS, DESIRED EDUCATION OVER TIME, AT LEAST 2 YRS COLLEGE

3



NOTE: DARKER AREA INDICATES ENLISTMENT-RELATIVE YEAR

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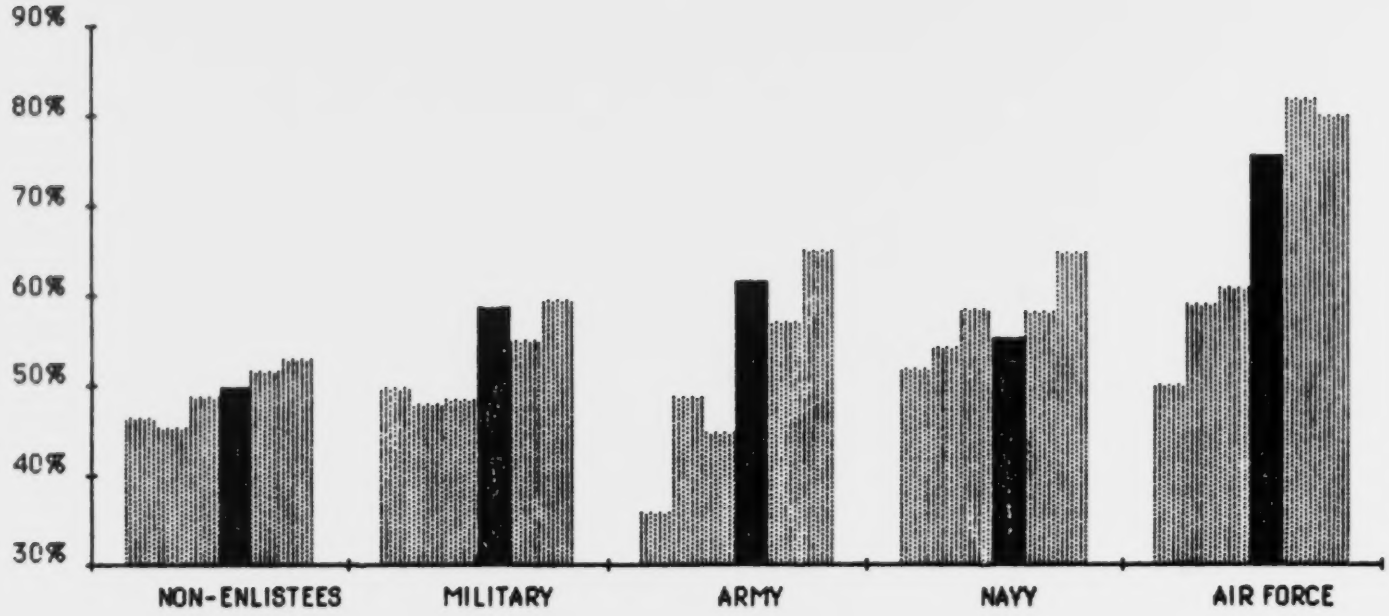
ALL GROUPS, EXPECTED EDUCATION OVER TIME, AT LEAST 2 YRS COLLEGE

4



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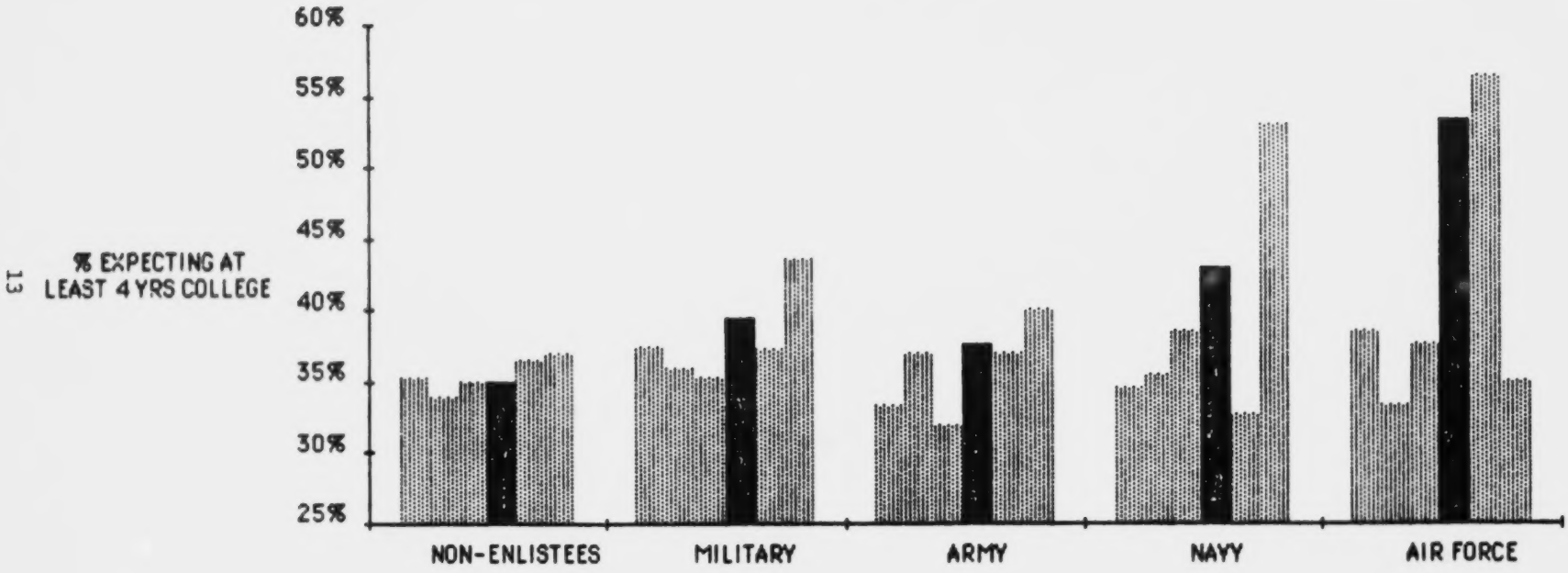
NOTE: DARKER AREA INDICATES ENLISTMENT-RELATIVE YEAR

ALL GROUPS,
EXPECTED EDUCATION
OVER TIME,
AT LEAST 4-YR DEGREE

5



NOTE: DARKER AREA INDICATES ENLISTMENT-RELATIVE YEAR

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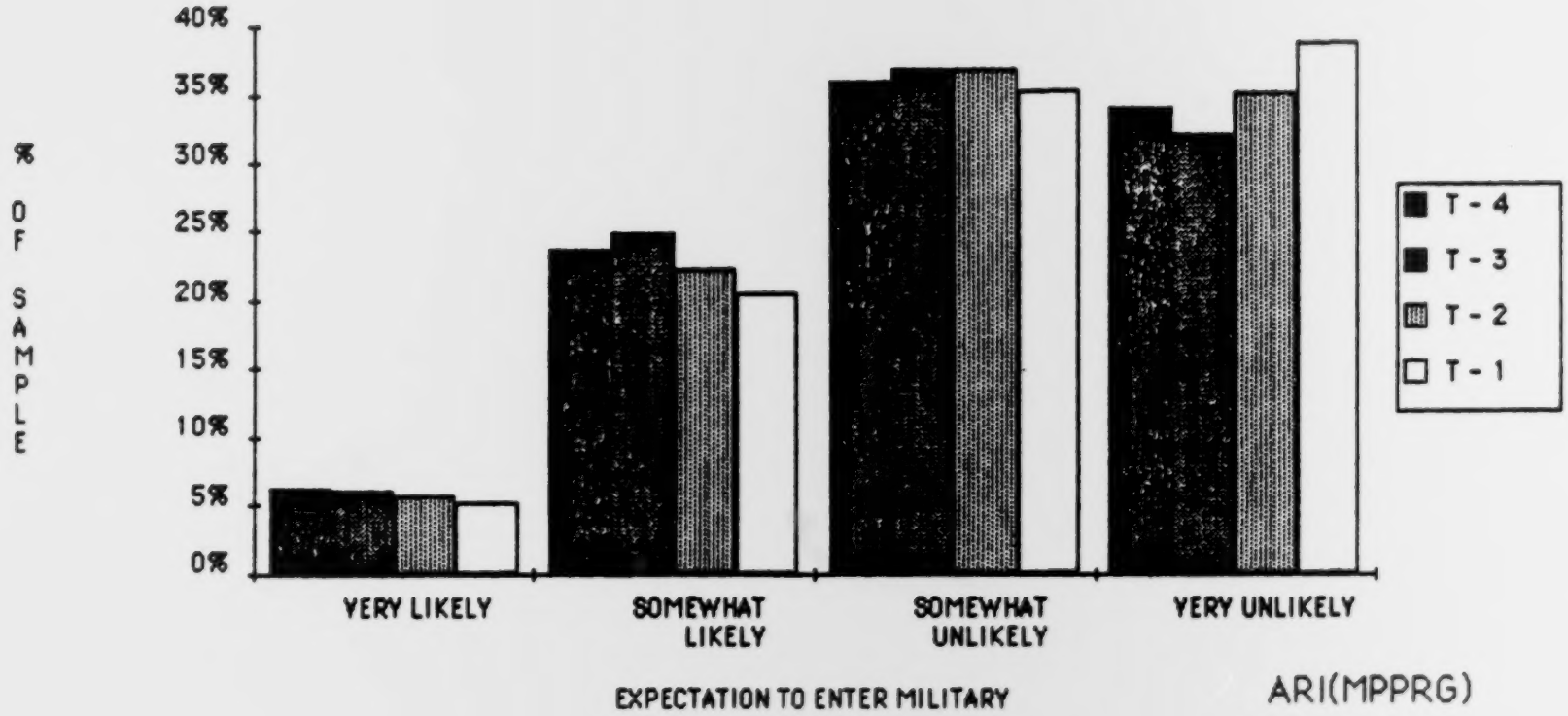
NON-ENLISTEES, EXPECTATION TO ENTER MILITARY OVER TIME

6



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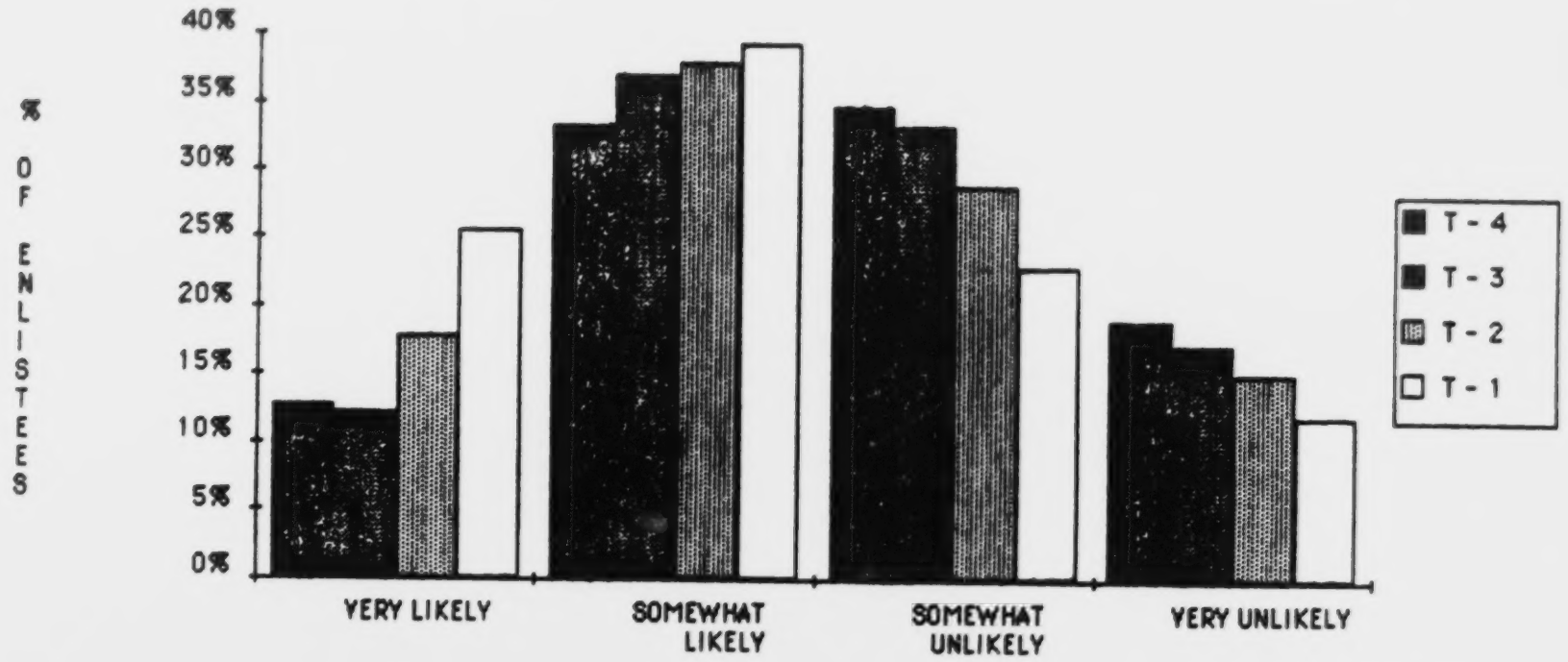
14

MILITARY ENLISTEES, EXPECTATION TO ENTER MILITARY OVER TIME

7



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ARMY ENLISTEES, EXPECTATION TO ENTER MILITARY OVER TIME

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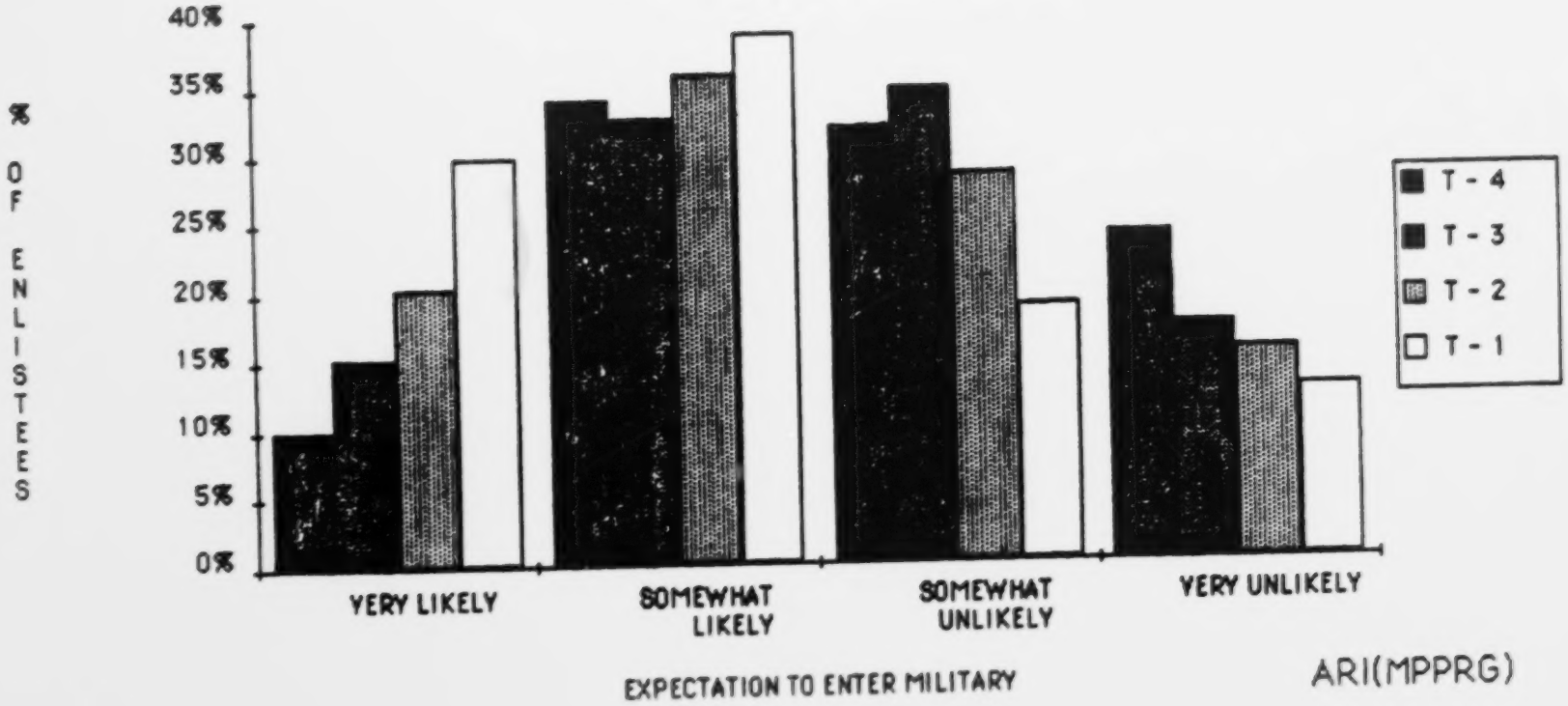
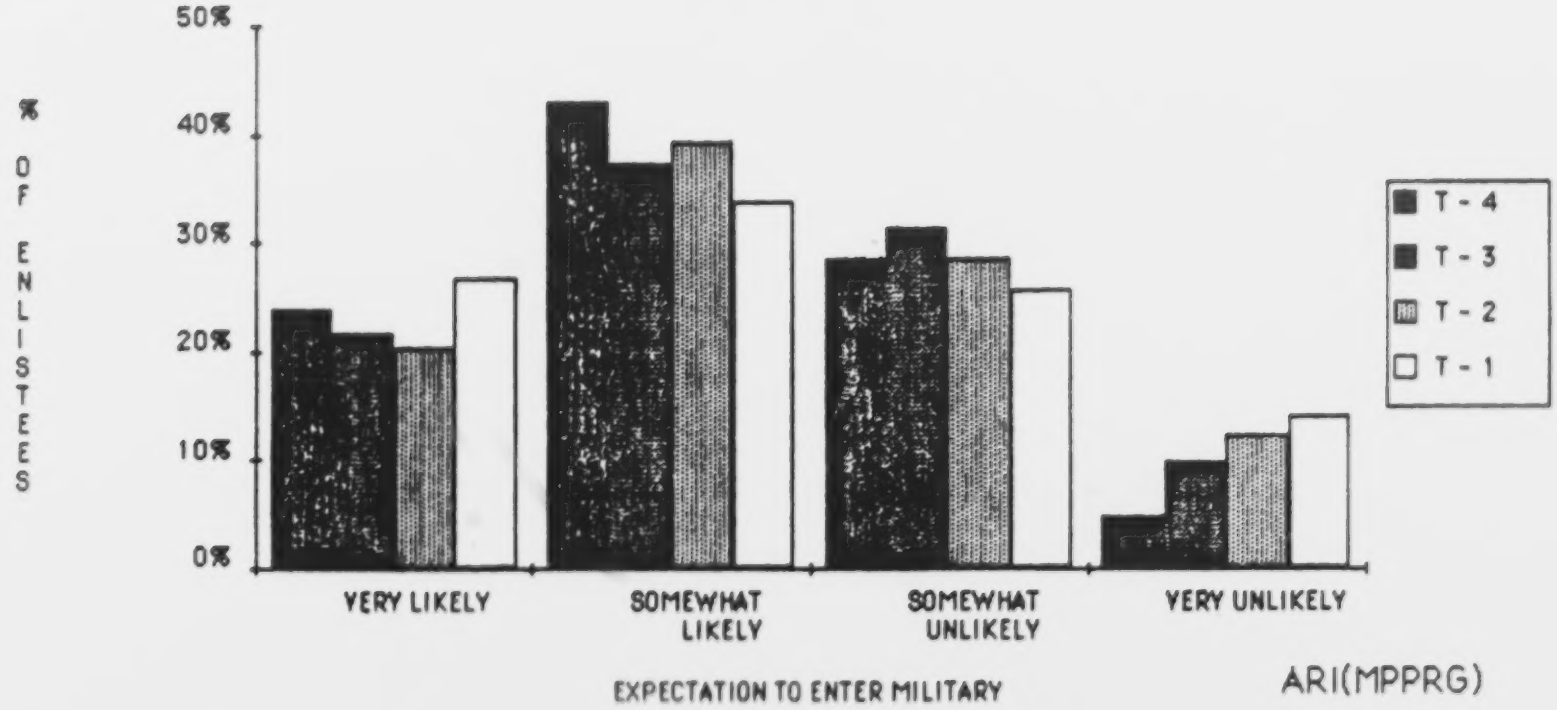


ARI(MPPRG)

16

NAVY ENLISTEES,
EXPECTATION TO
ENTER MILITARY
OVER TIME

9



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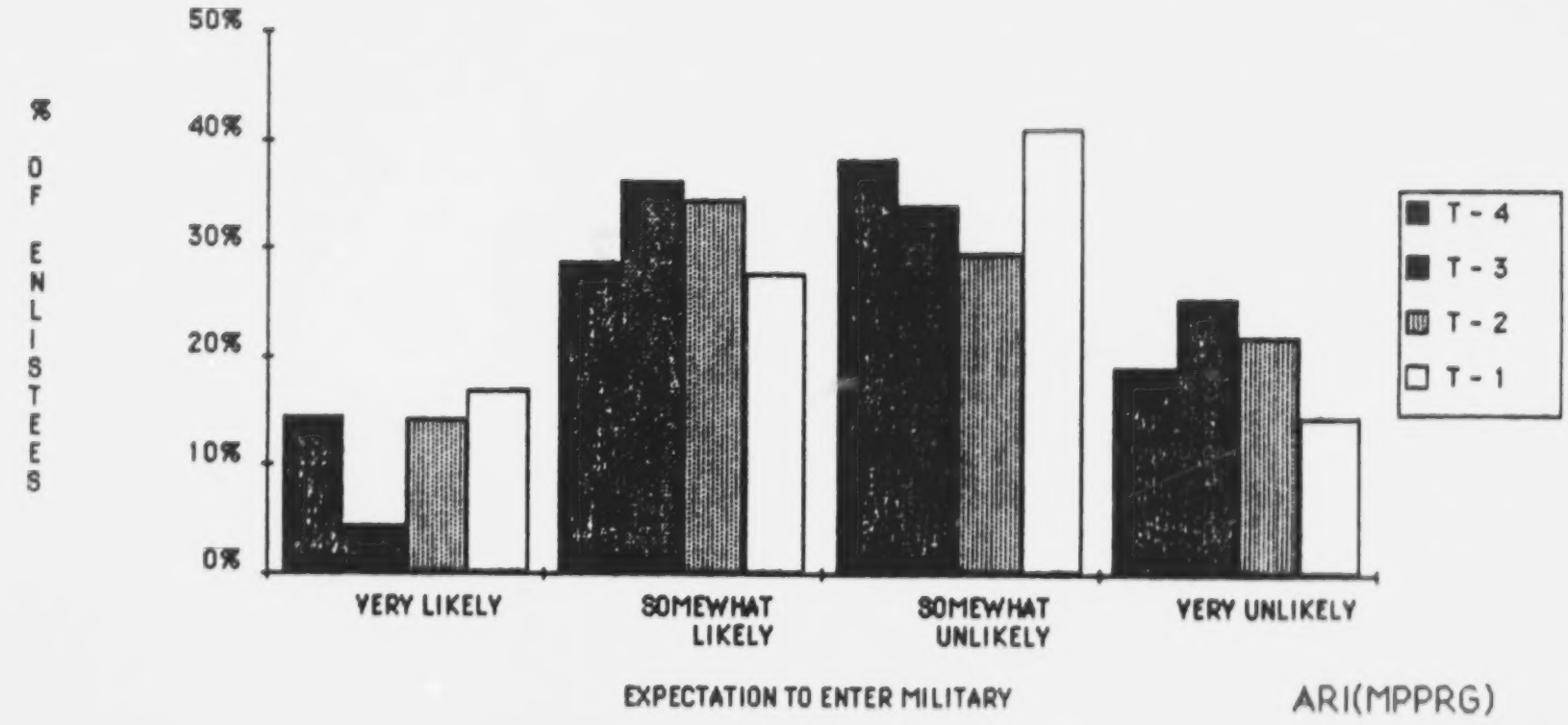
17

AIR FORCE ENLISTEES,
EXPECTATION TO
ENTER MILITARY
OVER TIME

10



ARI(MPPRG)

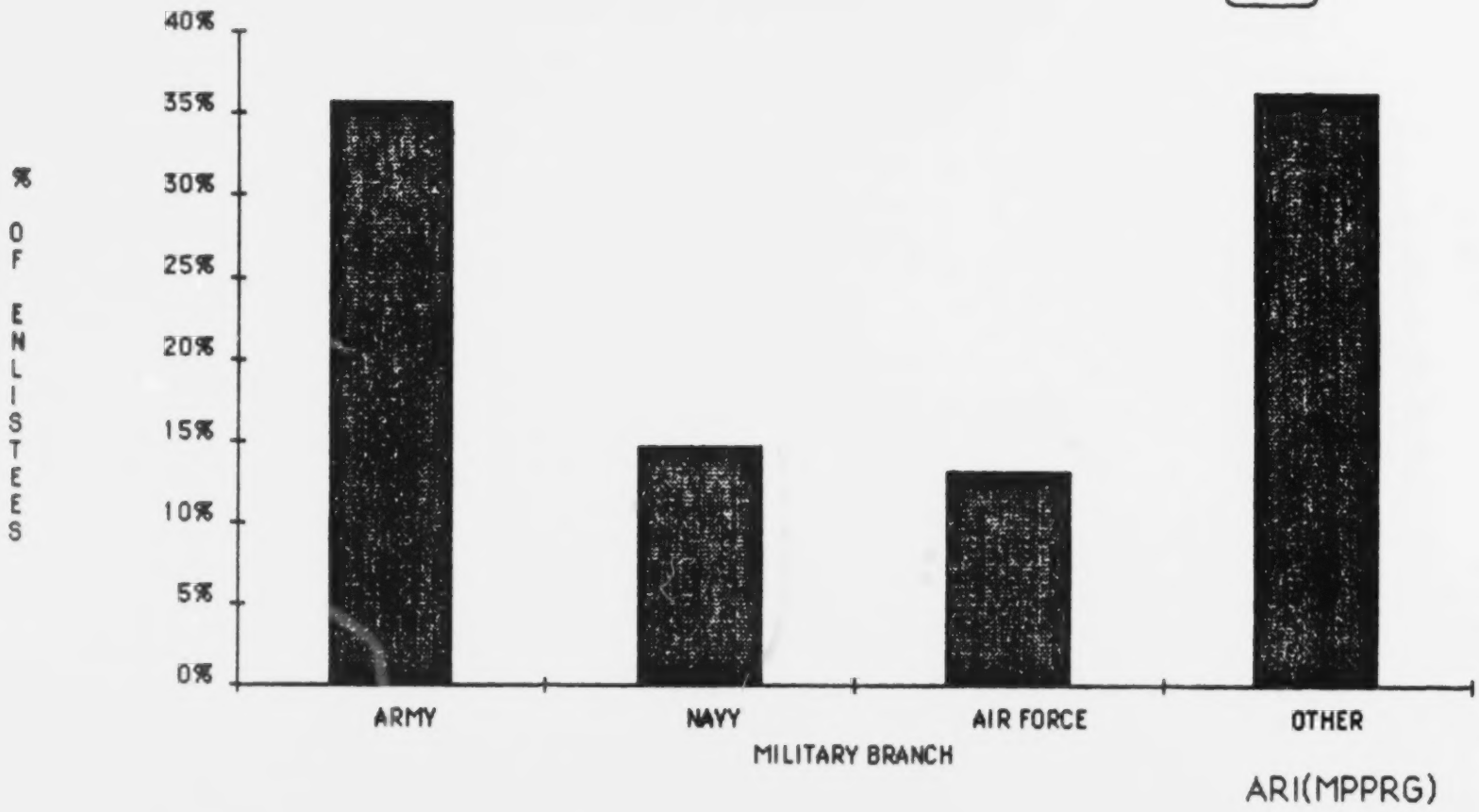
18

41

42

MILITARY SAMPLE
ACTUAL ENLISTMENTS

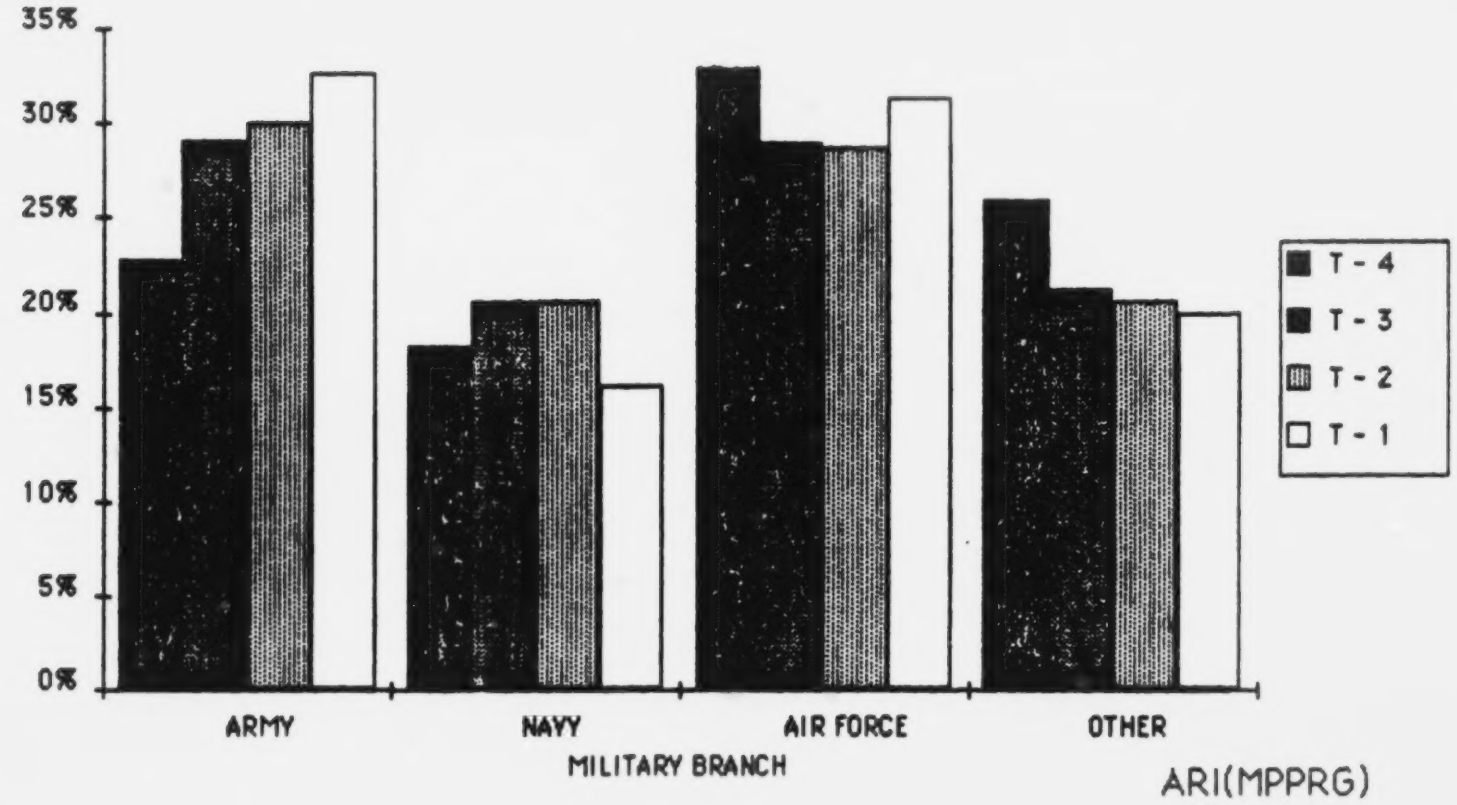
11



ARI(MPPRG)

NON-ENLISTEES,
EXPECTED BRANCH
TO JOIN, OVER TIME

12



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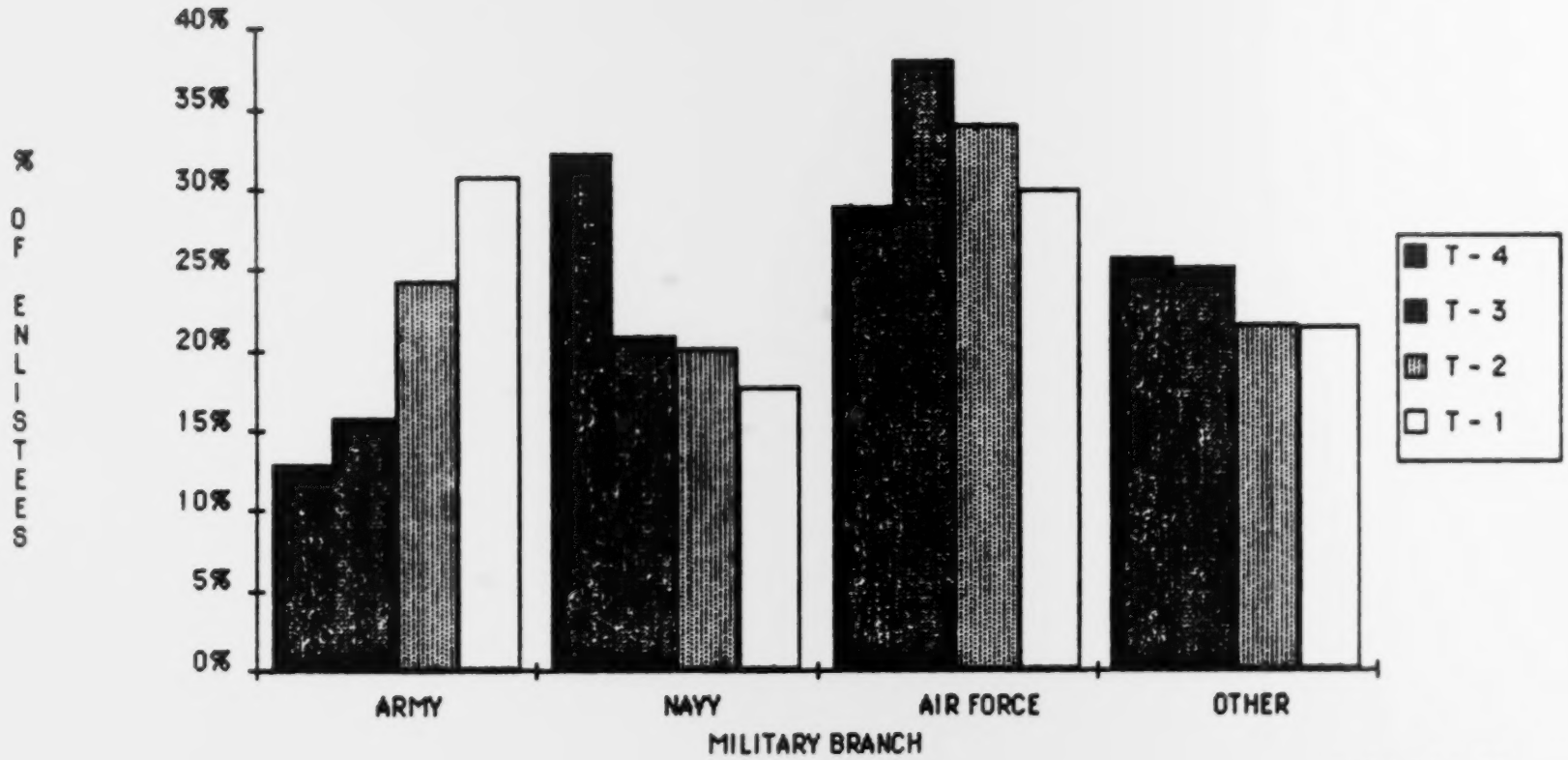
MILITARY ENLISTEES, EXPECTED BRANCH TO JOIN, OVER TIME

13



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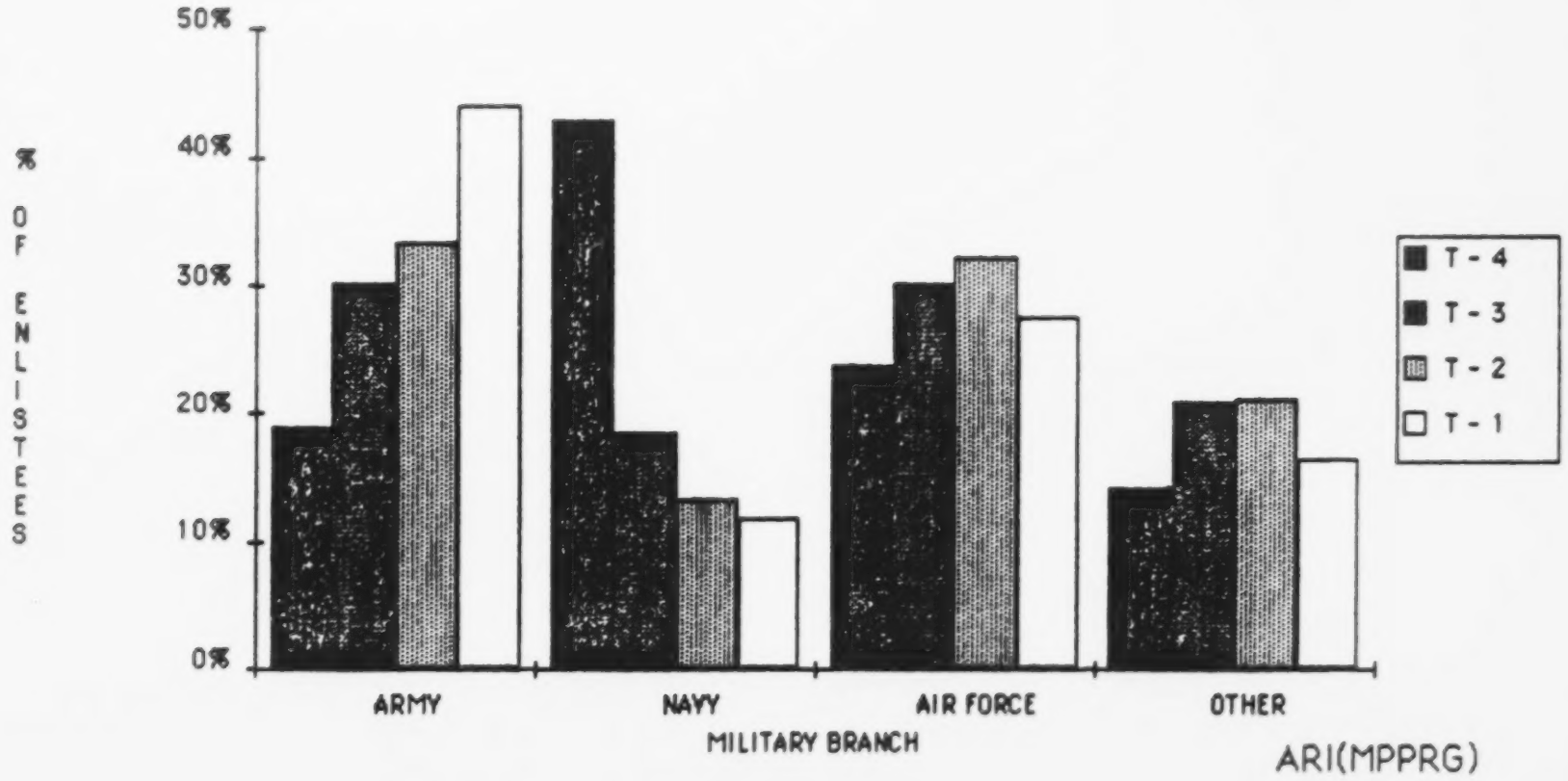
ARMY ENLISTEES,
EXPECTED BRANCH
TO JOIN, OVER TIME

14

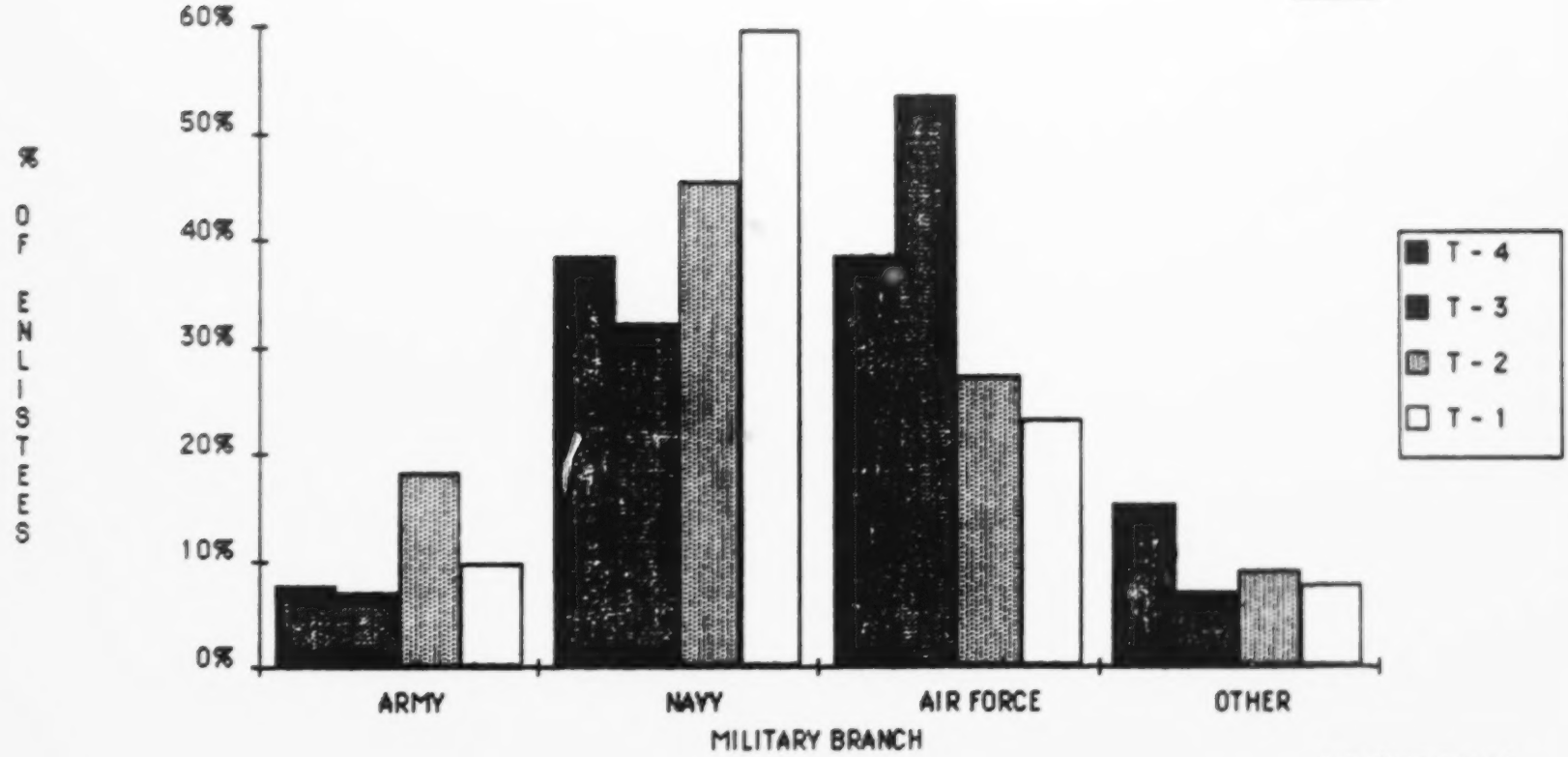


ARI(MPPRG)

22

NAVY ENLISTEES, EXPECTED BRANCH TO JOIN, OVER TIME

15



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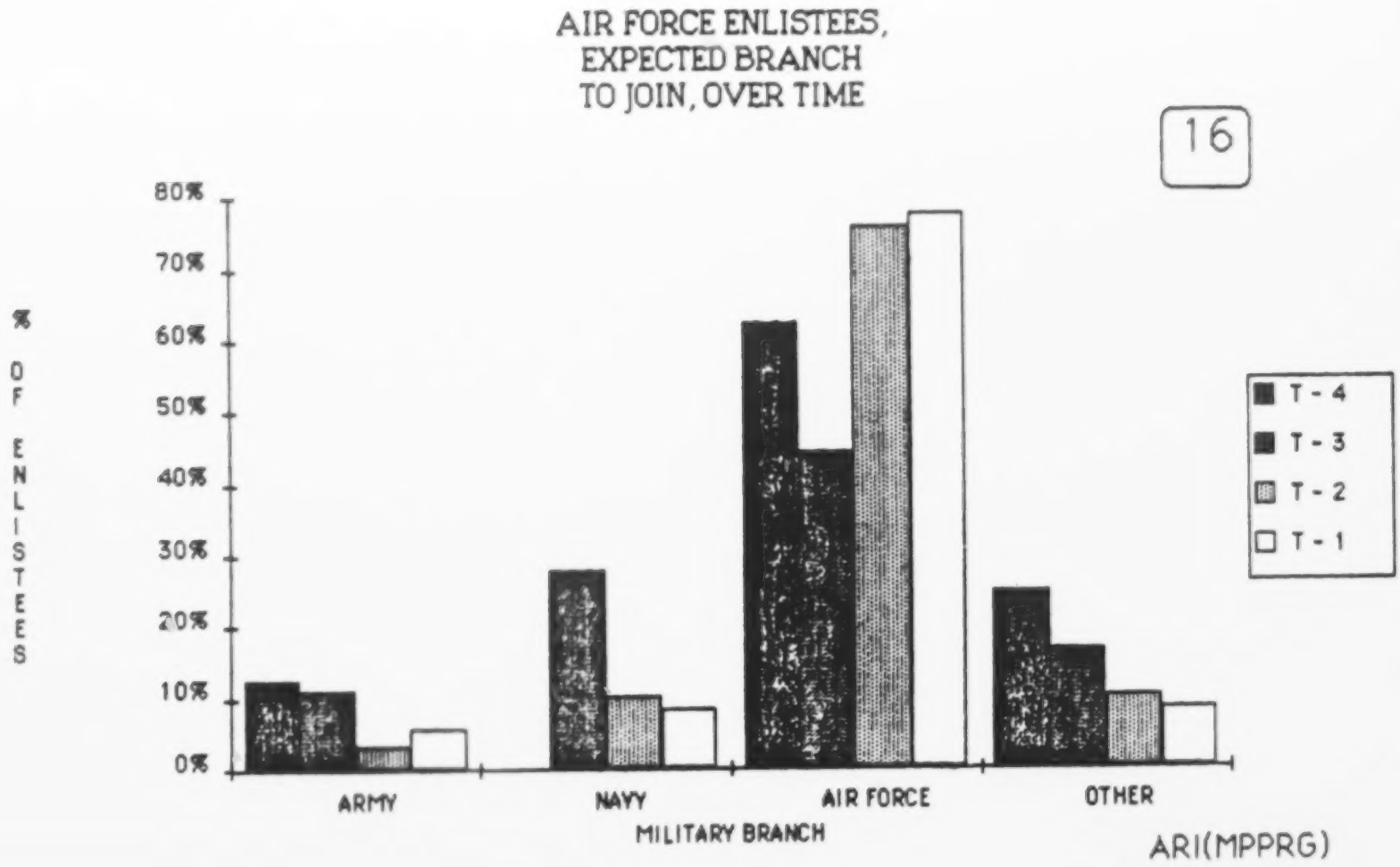

AIR FORCE ENLISTEES,
EXPECTED BRANCH
TO JOIN, OVER TIME
16
% OF ENLISTEES
80%
70%
60%
50%
40%
30%
20%
10%
0%
T - 4
T - 3
T - 2
T - 1
ARMY
NAVY
AIR FORCE
OTHER
MILITARY BRANCH
ARI(MPPRG)

METHODOLOGY AND RESULTS

Research has shown propensity to be correlated with enlistment. However, a number of alternative models could be proposed to explain the process. In this section we discuss some of the models that could be proposed, specify a particular model, estimate its coefficients, and use this model to make projections of how altering various factors would change enlistment rates.

Models of the Enlistment Decision

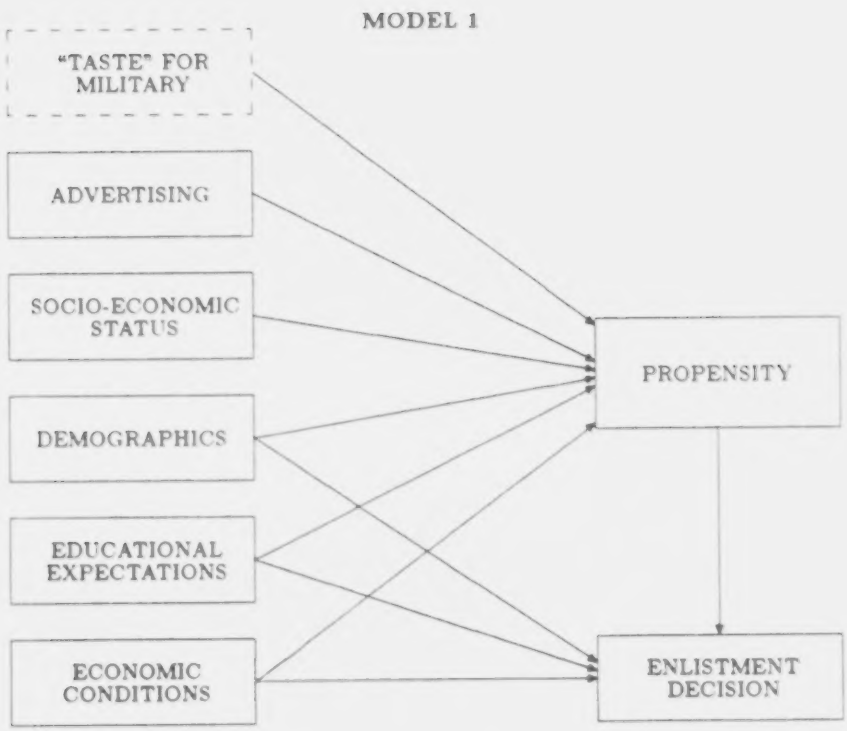
There are several different approaches that would explain the relationship of propensity to enlistment. Figure 17, model 1 illustrates one such mechanism. In this model it is hypothesized that propensity and the enlistment decision are simultaneously influenced by many of the same factors: educational expectations, demographics, and economic conditions. However, propensity is also affected by observable factors that are not directly related to the enlistment decision.

Model 2 provides another hypothetical relationship between propensity and enlistment. Here the various independent factors are related to propensity and the enlistment decision in a recursive manner. Advertising, socio-economic status, economic conditions, and demographics all influence propensity, which in turn determines the outcome of the enlistment decision. If this model is correct, then the enlistment decision can be modeled without knowing propensity, since propensity is determined by other observable measures. Note, however, that if this is the correct model, knowledge of propensity will improve the accuracy of prediction, because propensity provides information about "taste for military service" that is not contained in other variables.

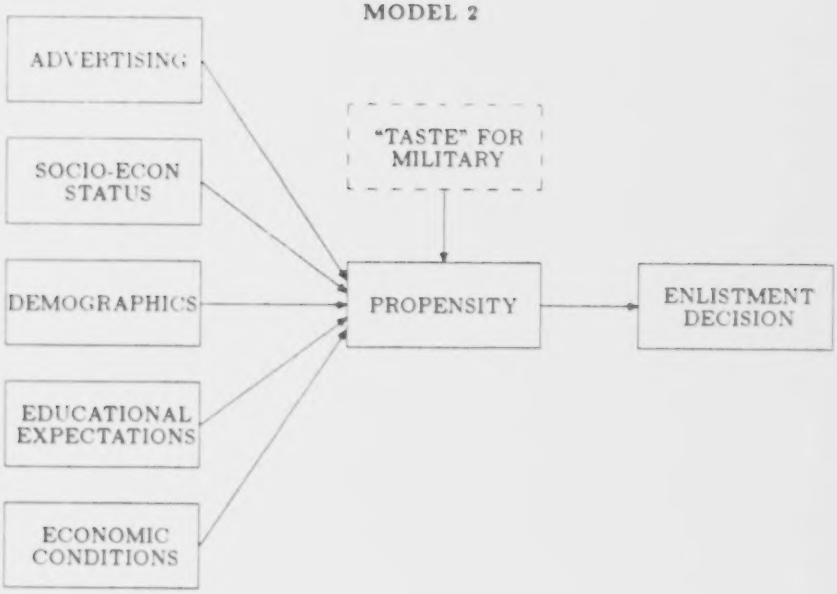
A second issue in the modeling of the enlistment decision is the dynamic nature of the process. Even if propensity measures an independent characteristic, it is important to know whether such a factor is fixed or changes over time. If a variable changes, and if such changes are associated with altered decisions, it may be feasible to change decisions by changing variables that predict the decision, through advertising and marketing.

MODELS OF THE ENLISTMENT DECISION

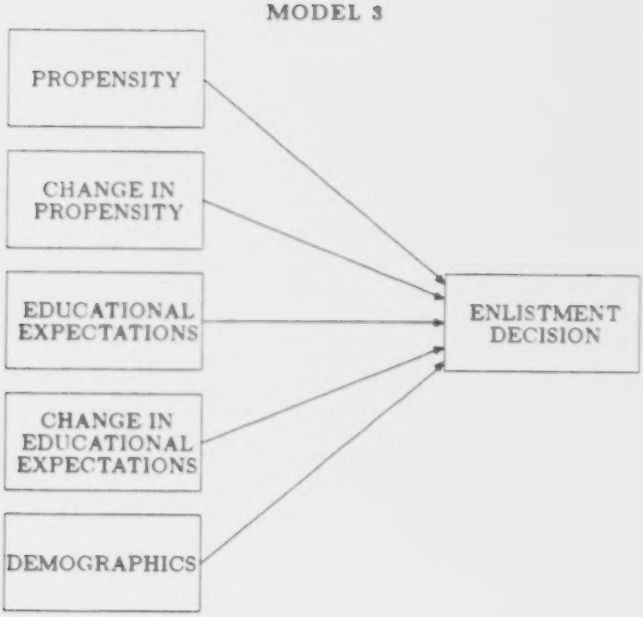
FIGURE 17



MODEL 2



MODEL 3



This kind of dynamic model, shown in Model 3, was developed for estimation purposes. Its principal features include:

1. A test of whether propensity produces an enlistment effect independent of socio-demographic characteristics, and
2. How changes in variables over time affect the enlistment decision.

This second aspect of the model is particularly important and is an extension over previous research. For example, those individuals who have always planned to attend college may be hypothesized to have a low enlistment probability. However, the effect for those who change their educational expectations is less clear. Rising expectations could produce decreasing enlistment rates, or they could be associated with increasing enlistments if the military is viewed as a way to finance college.

Multivariate Analysis

To determine the relationships among enlistment, propensity to enlist, and background variables, a logistic regression (logit) model was used. This approach models the probability of enlistment as a function of enlistment propensity and other individual characteristics. The model takes the following form:

$$Prob(C_i = 1) = \frac{1}{1 + e^{-\left(\alpha + \sum_{j=1}^{k} \beta_j X_{ij}\right)}}$$

Where:

- $Prob(C_i = 1)$ denotes the probability that individual i will choose to enlist
- e is the natural anti-log
- α represents the logistic regression intercept term
- X_{ij} denotes the value of the j^{th} explanatory variable for individual i
- k is the total number of explanatory variables
- β_j represents the effect of the j^{th} explanatory variable on the probability of enlistment

This form of the equation constrains the dependent variable, here the probability of enlistment, to take on values between 0 and 1. This is illustrated in Figure 18:

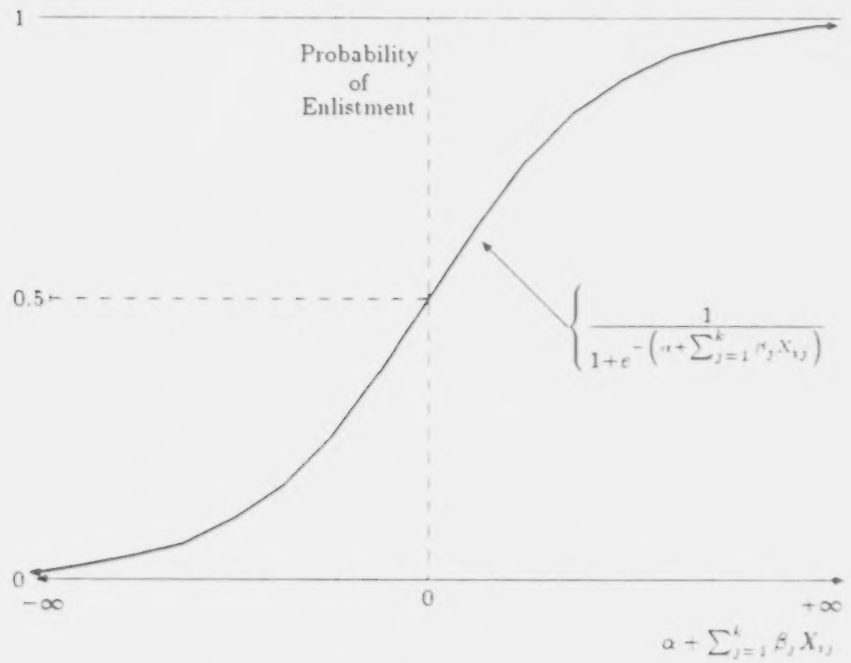


Figure 18. The Logistic Regression Curve

The vertical axis, representing the probability of enlistment, is constrained by the values *0* and *1*. The regression line approaches *0* and *1* asymptotically as the value of the explanatory variable (on the *X* axis) approaches negative or positive infinity.

Missing values for variables used in the multivariate analyses were replaced by means of the non-missing values. In addition, since we were primarily interested in the behavior of military-eligible high school diploma graduates, individuals who did not receive a diploma by the end of the sample period and those with "adjusted" AFQT scores below the tenth percentile were also dropped. This left a final sample of 6239 individuals, 373 of whom enlisted in the military within the sample period.

In developing the model, a number of variables hypothesized to have predic-

tive validity were examined. However, many of these variables were correlated with but not as strong a predictor of enlistments as the final variables. The hypothesized full model included local unemployment rates (based on State-level, male, prime-aged, manufacturing unemployment rates), family income or socioeconomic status, relatives having served in the military, contact with a military recruiter while still in high school, AFQT, intentions to enlist, race/ethnic group, gender, and educational/training aspirations. (For the model, prior service personnel, those with AFQT scores less than the 11th percentile, and non-high school degree graduates are eliminated).

The reduced multivariate model includes the following variables:

- AFQT refers to "renormed" AFQT score at age 17, and takes values from 11 to 99.
- AFQT SQUARED is a variable which determines the shape of the AFQT curve.
- POSITIVE INTENT is a binary, with *1* referring to a stated intention of enlistment of either "somewhat likely" or "very likely".
- NEGATIVE INTENT is a binary, with *1* referring to a stated intention of enlistment of "very unlikely". Thus, if the positive intent and negative intent variables both have values of *0*, the stated intention of enlistment is "somewhat unlikely".
- BLACK is a binary, with *1* referring to Blacks, *0* to all others.
- FEMALE is a binary, with *1* referring to females.
- ADDITIONAL TRAINING is a binary, with *1* referring to people who desire additional training *outside* of school.
- EXPECT 4-YEAR DEGREE is a binary, with *1* referring to people who expect to receive at least a 4-year college degree.
- CHANGE IN EDUCATIONAL EXPECTATION refers to the difference in number of years of expected education, between approximately 16-17 and 17-18 years of age. It ranges from -6 to 10 years, although is usually either 0, 2, or 4 years. A reasonable range expectation would be -4 to 6 years, reflecting changing expectations of college and post-college work.
- CHANGE IN ENLISTMENT EXPECTATIONS refers to the difference in expectation (intentions) to enlist between 16-17 and 17-18 years of age,

and ranges from a value of -3 to +3. **Positive** values indicate **higher** expectations to enlist. This variable reflects the difference between two years of the Intent variable, which has the following responses to the question, "How likely are you to enlist in the Military?":

1. Very likely
2. Somewhat likely
3. Somewhat unlikely
4. Very unlikely

Thus, a value of +3 indicates that the individual changed his expectation to enlist from "very unlikely" to "very likely", while -3 indicates the opposite.

Table 3 presents summary statistics for these variables. Table 4 provides coefficient estimates and standard errors for the multivariate model.

Table 3. Descriptive Statistics

VARIABLE	RANGE	MEAN	STD
Enlist	0 or 1	0.0598	0.2371
Adjusted AFQT	11 to 99	52.7359	25.7027
Positive Intent	0 or 1	0.2359	0.4246
Negative Intent	0 or 1	0.3880	0.4874
Black	0 or 1	0.1941	0.3955
Female	0 or 1	0.5501	0.4975
Additional Training	0 or 1	0.6657	0.4718
Expect 4-Yr. Degree	0 or 1	0.4593	0.4984
Change in Educational Expectation	-4 to +6	0.1637	1.6787
Change in Enlistment Expectation	-3 to +3	0.0259	0.8419

Table 4. Logistic Regression Results			
VARIABLE	β	σ	P
Intercept	-3.2903	0.3266	0.0000
Adjusted AFQT	0.0305	0.0110	0.0056
AFQT Squared	-0.0003	0.0002	0.0054
Positive Intent	1.2700	0.1688	0.0000
Negative Intent	-0.7121	0.2397	0.0030
Black	0.4238	0.1402	0.0025
Female	-1.1312	0.1214	0.0000
Additional Training	0.4078	0.1518	0.0072
Expect 4-Yr. Degree	-0.6375	0.1866	0.0006
Change in Educational Expectation	0.1823	0.0898	0.0424
Change in Enlistment Expectation	0.2306	0.0951	0.0153
Total Observations = 6239			
Enlistments = 373			
-2 Log Likelihood = 2495.02			
Fraction of Concordant Pairs = 0.729			
Rank Correlation = 0.512			

Here, β refers to each variable's coefficient value, where the intercept $\beta = \beta_0$. The standard error for each β is σ, and P is the probability that each variable is not zero. The *-2 Log Likelihood*, *Fraction of Concordant Pairs*, and *Rank Correlation* statistics are measures of how well the models predict enlistment decisions. Among the findings of this logit analysis were:

- Over its lowest ranges, AFQT increases have a positive effect on enlistment probability (holding other factors constant). This effect declines as AFQT becomes larger, and becomes negative for AFQT scores larger than 55.
- Positive Intent to join the military is strongly related to actual enlistments. Furthermore, a rise in the expectation of enlisting has a significant effect over and above the level of intent itself.
- A statement of strong negative intent to join the military significantly reduces the probability of enlistment, as compared to a mildly negative statement.
- Blacks are more likely to enlist than are other groups.
- Females are less likely to enlist than males.
- Those desiring additional training outside of school are more likely to enlist than are people who do not desire this training.

- Expectation of a 4-year college education at age 17 is a negative indicator of enlistment. However, rising expectations of education in the two years prior to enlistment is associated with higher enlistment probability.

Enlistment Probability Projections

The information from the logistic regression can be used to project enlistment rates for various types of people. To make these projections, hypothetical values were used for the explanatory variable, representing a fairly typical recruit. This "typical" recruit represents a white, 17-year-old, High School Diploma Graduate male with an AFQT score over 10. Each of the other model variables were set to their respective means (with $AFQT = 50$), and one variable changed at a time. This allows one to see the impact of changes in the variable of interest, while holding other explanatory factors constant. To assess impacts due to gender and race, the "typical" recruit was changed to reflect male and female, white and black.

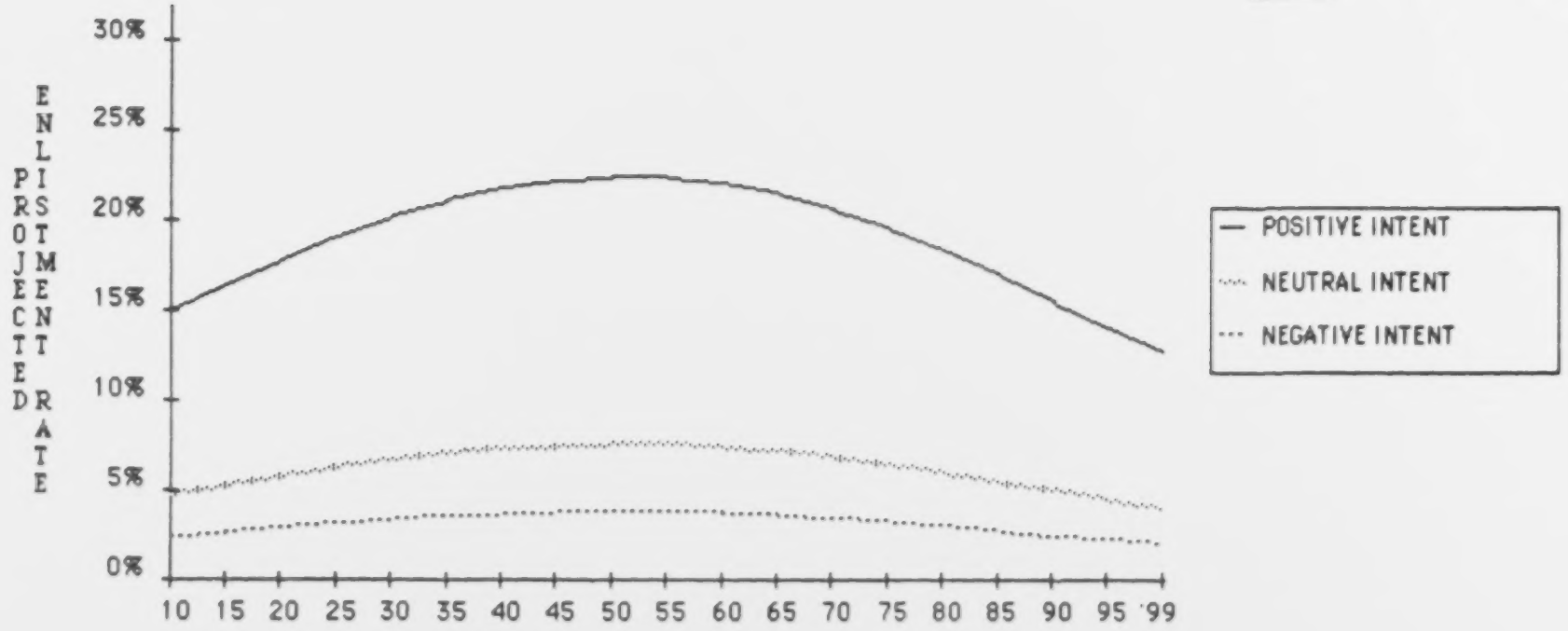
Figures 19-22 show the effect of propensity and AFQT on enlistment rate. The maximum enlistment probability is for an individual with a test score slightly above 50. At that score a white male with a positive intent (very or somewhat likely) would enlist at a rate of about 22 percent, compared to 7 percent for one who was neutral, or 3 percent for those with negative intentions.

Figures 23-26 show the effect of changing intentions (positive values indicate *increases* in propensity). A white male whose intentions had moved one unit more positive had an enlistment rate almost 2 percent greater than predicted from his intention level alone. Thus, dynamic information about intention behavior adds substantial explanatory power to static information on intentions at any point in time.

The next figures show how education and training attitudes affect enlistment behavior. Figures 27-30 illustrate that those desiring training other than college enlist at a substantially higher rate. Figures 31-34 and 35-38 show the differences between static and dynamic educational expectations. Those intending to go to college have substantially lower enlistment rates. However, individuals who experience an increase in educational expectations have substantially higher enlistment rates. For example, white males with an increase in educational expectations of four years had nearly twice the mean enlistment rate.

PROJECTED ENLISTMENT RATES
BY AFQT AND INTENT,
WHITE 17-YR-OLD HSDG MALES

19



ARI(MPPRG)

PROJECTED ENLISTMENT RATES BY AFQT AND INTENT, BLACK 17-YR-OLD HSDG MALES

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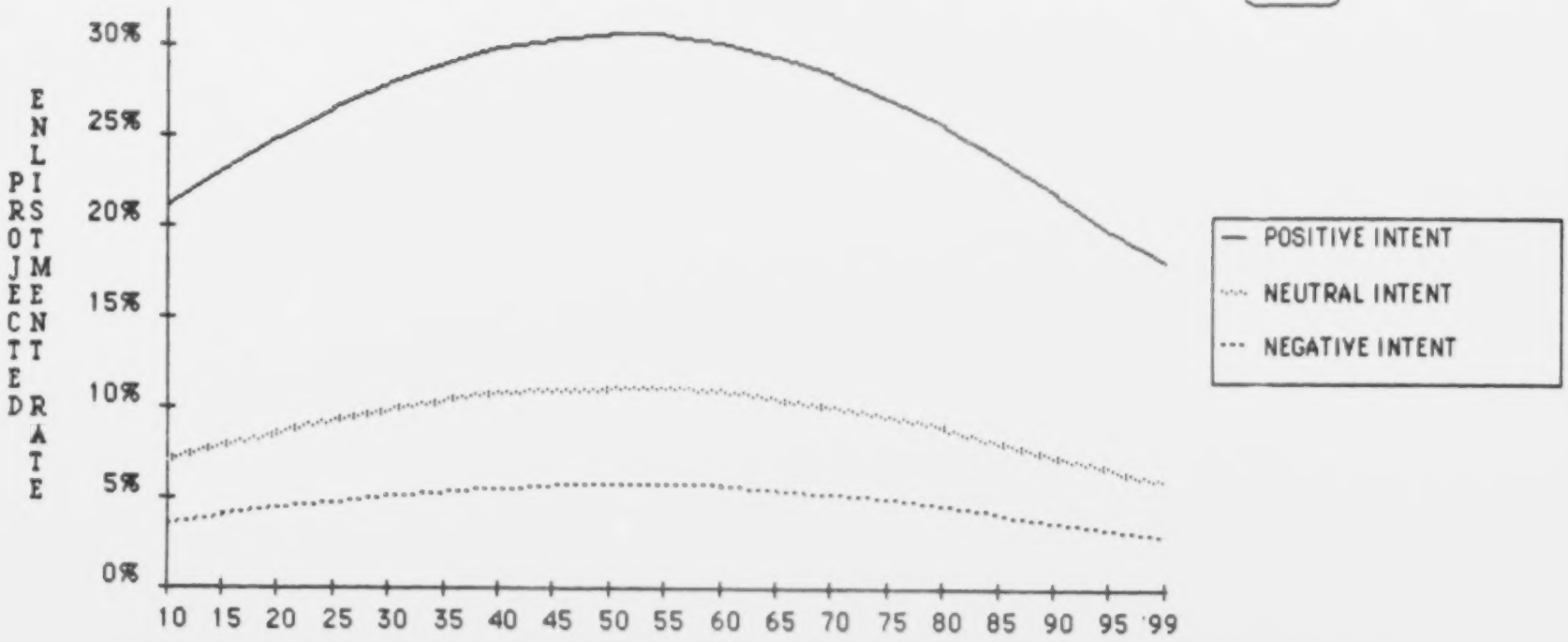
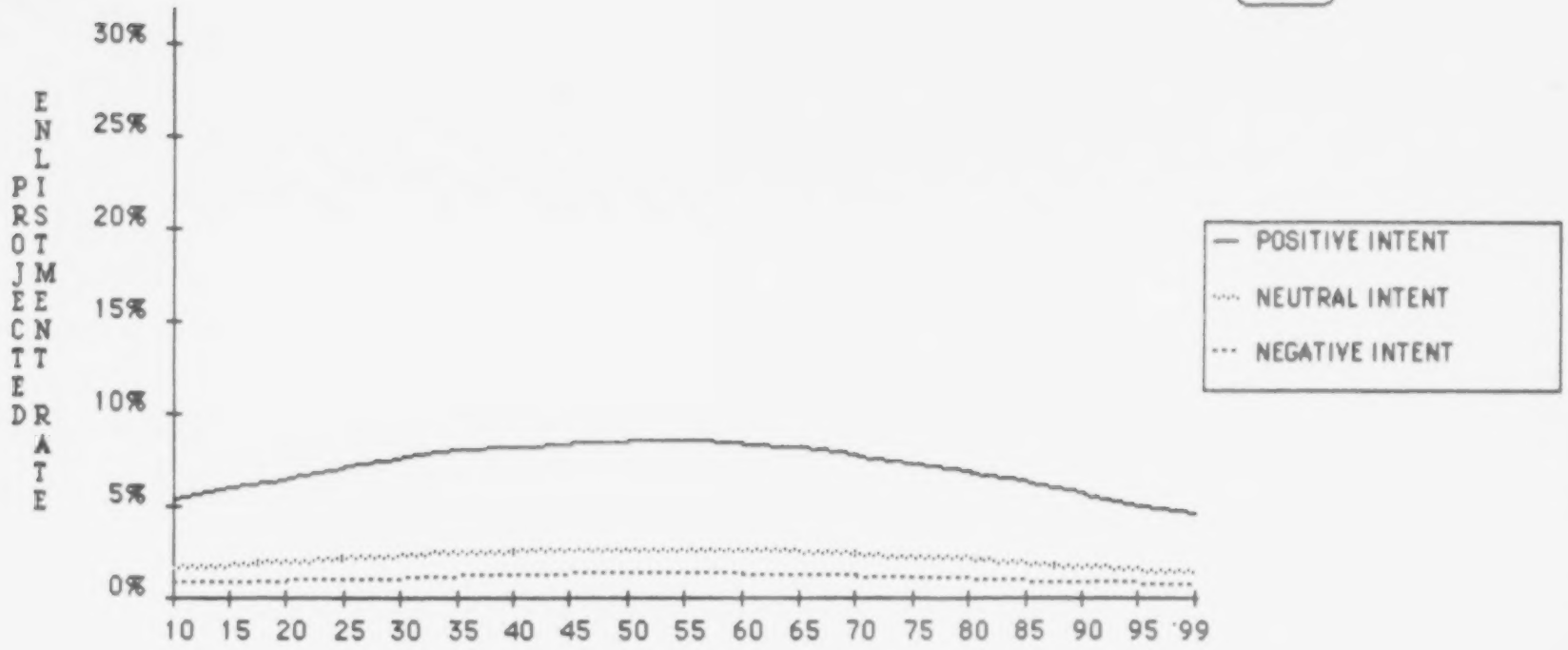


ARI(MPPRG)

PROJECTED ENLISTMENT RATES BY AFQT AND INTENT, WHITE 17-YR-OLD HSDG FEMALES

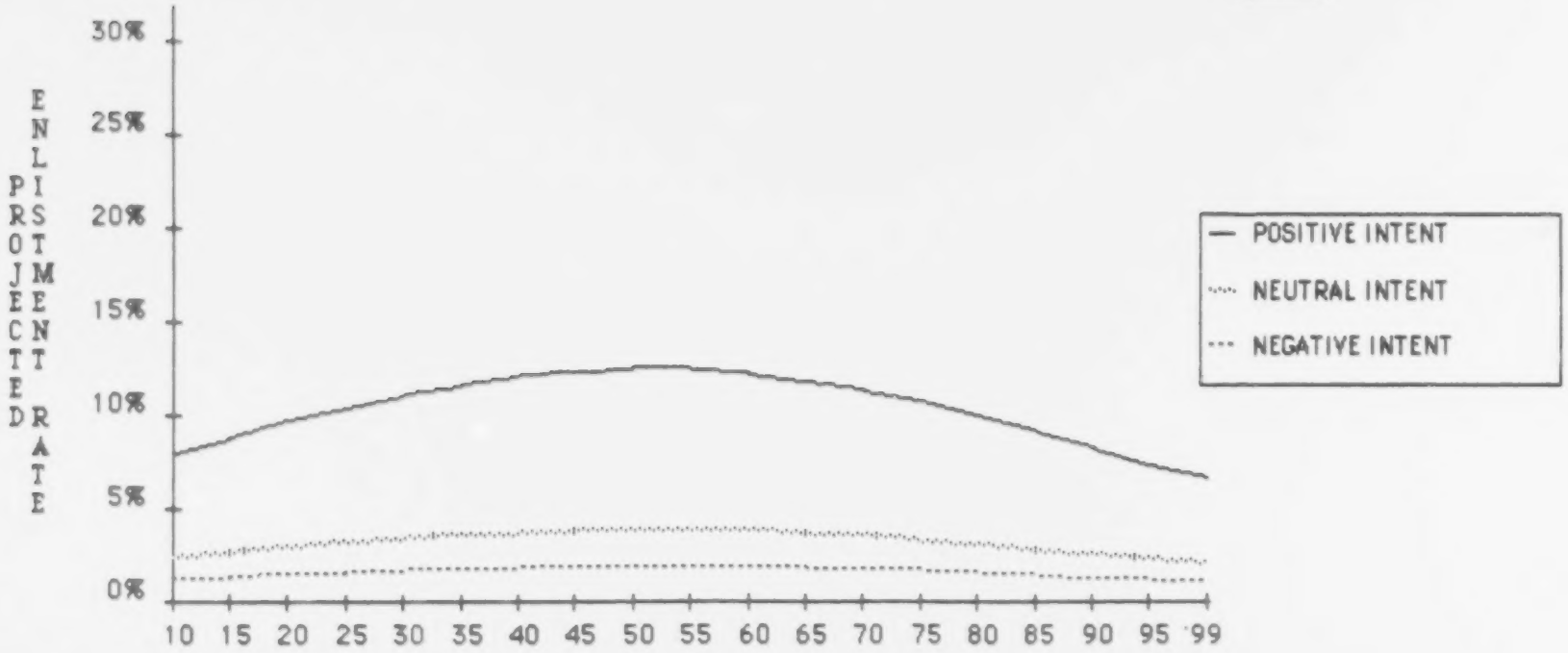
21



ARI(MPPRG)

PROJECTED ENLISTMENT RATES BY AFQT AND INTENT, BLACK 17-YR-OLD HSDG FEMALES

22

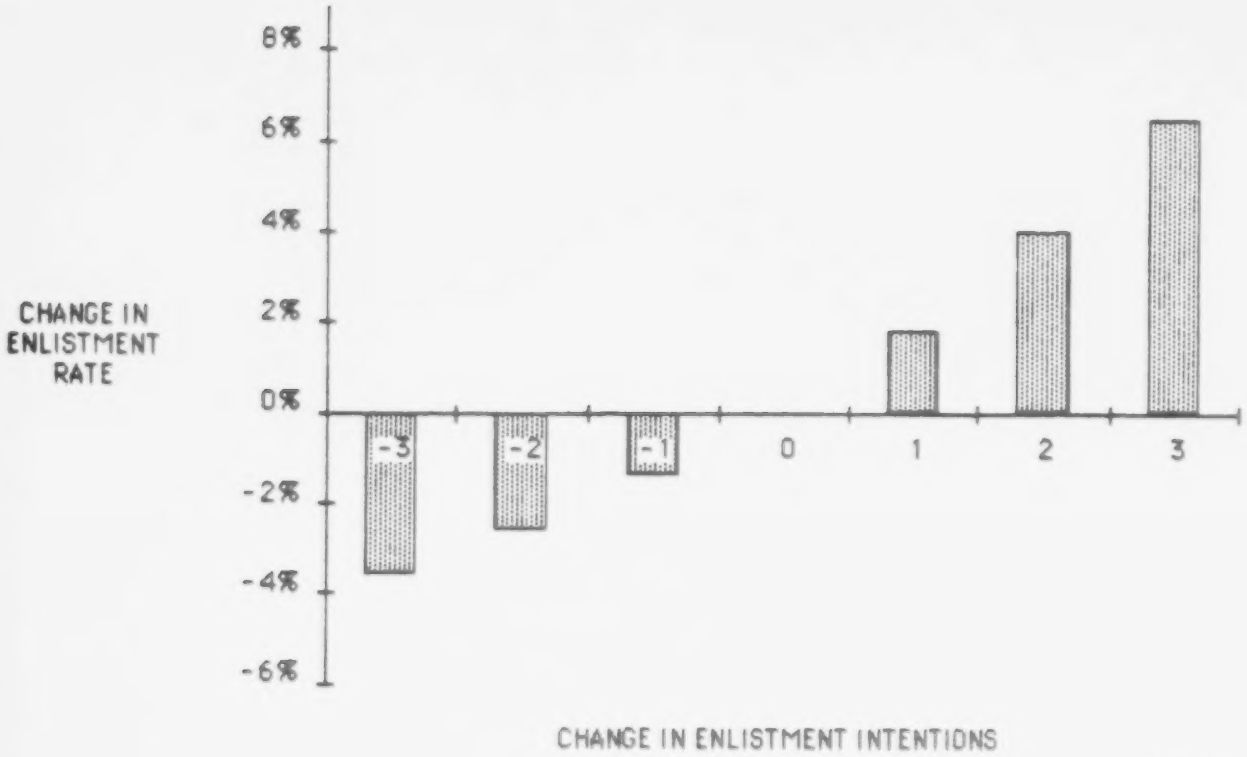


ARI(MPPRG)

37

CHANGE IN ENLISTMENT RATE BY CHANGE IN ENLISTMENT INTENTIONS, WHITE 17-YR-OLD HSDG MALES

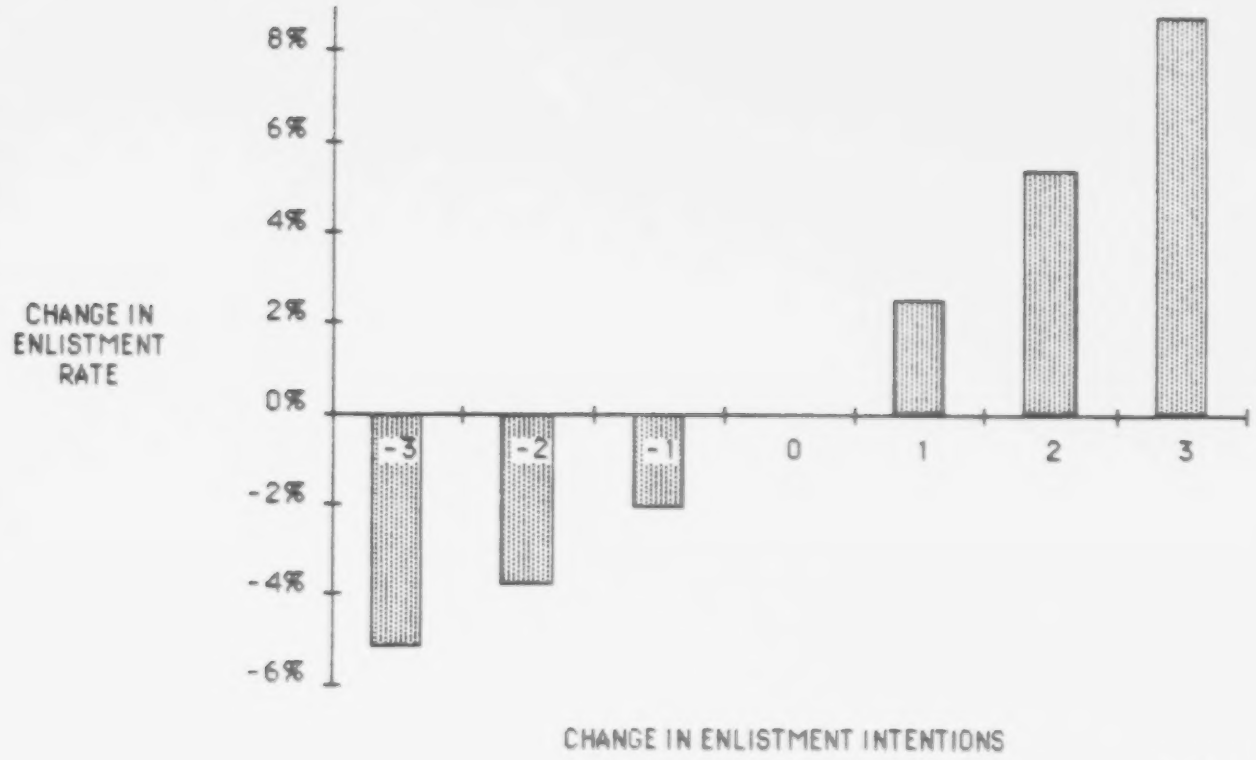
23



ARI (MPPRG)

CHANGE IN ENLISTMENT RATE BY CHANGE IN ENLISTMENT INTENTIONS, BLACK 17-YR-OLD HSDG MALES

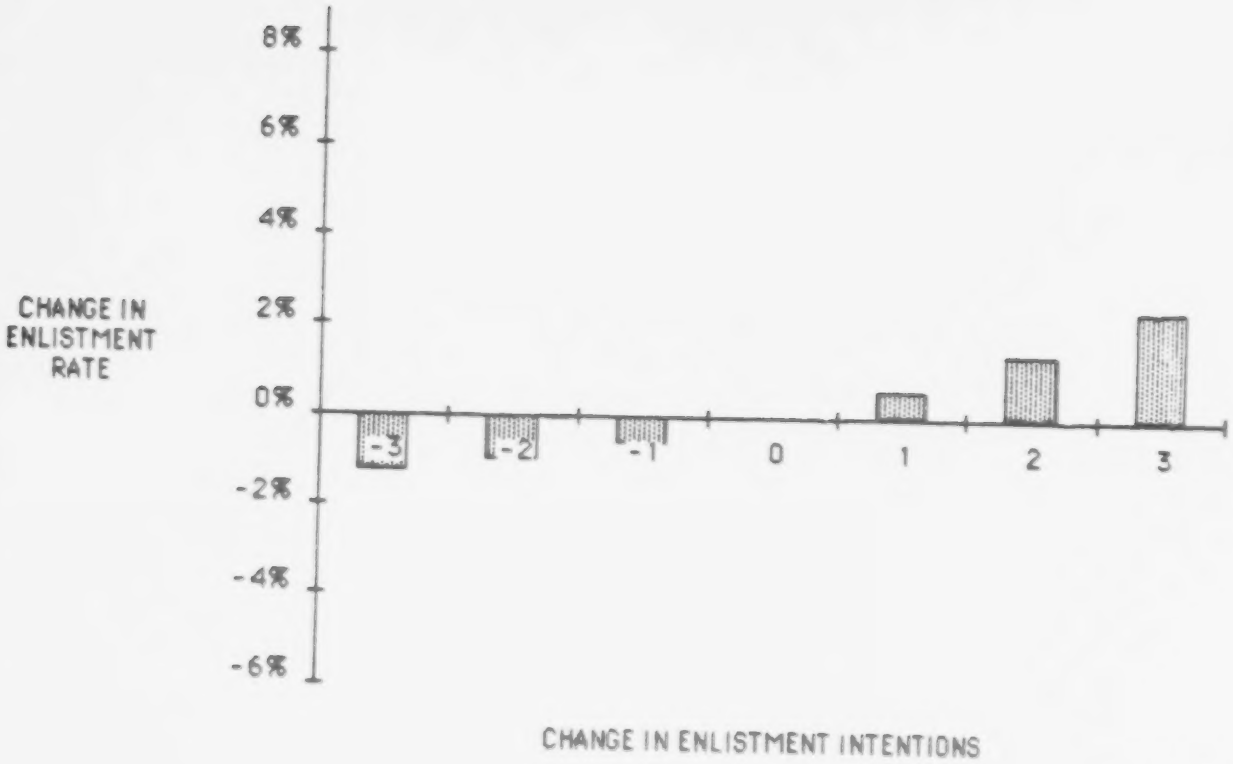
24



ARI (MPPRG)

CHANGE IN ENLISTMENT RATE BY CHANGE IN ENLISTMENT INTENTIONS, WHITE 17-YR-OLD HSDG FEMALES

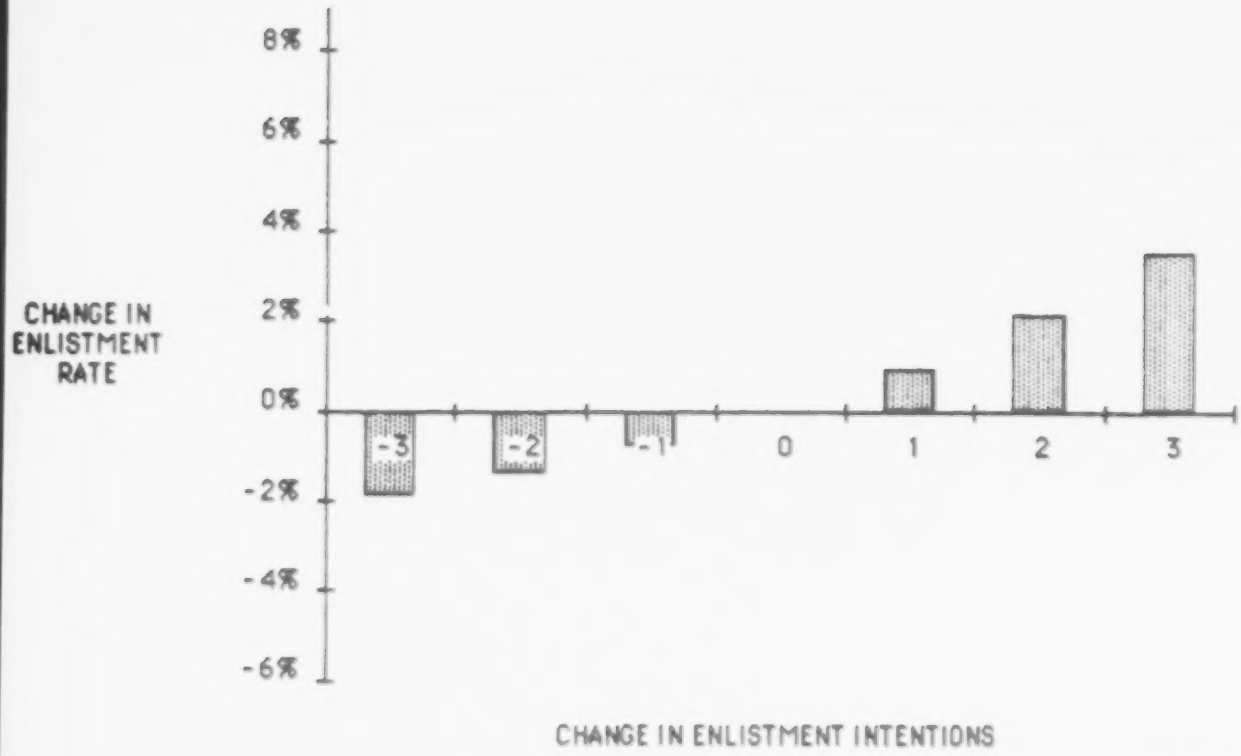
25



ARI (MPPRG)

CHANGE IN ENLISTMENT RATE BY CHANGE IN ENLISTMENT INTENTIONS, BLACK 17-YR-OLD HSDG FEMALES

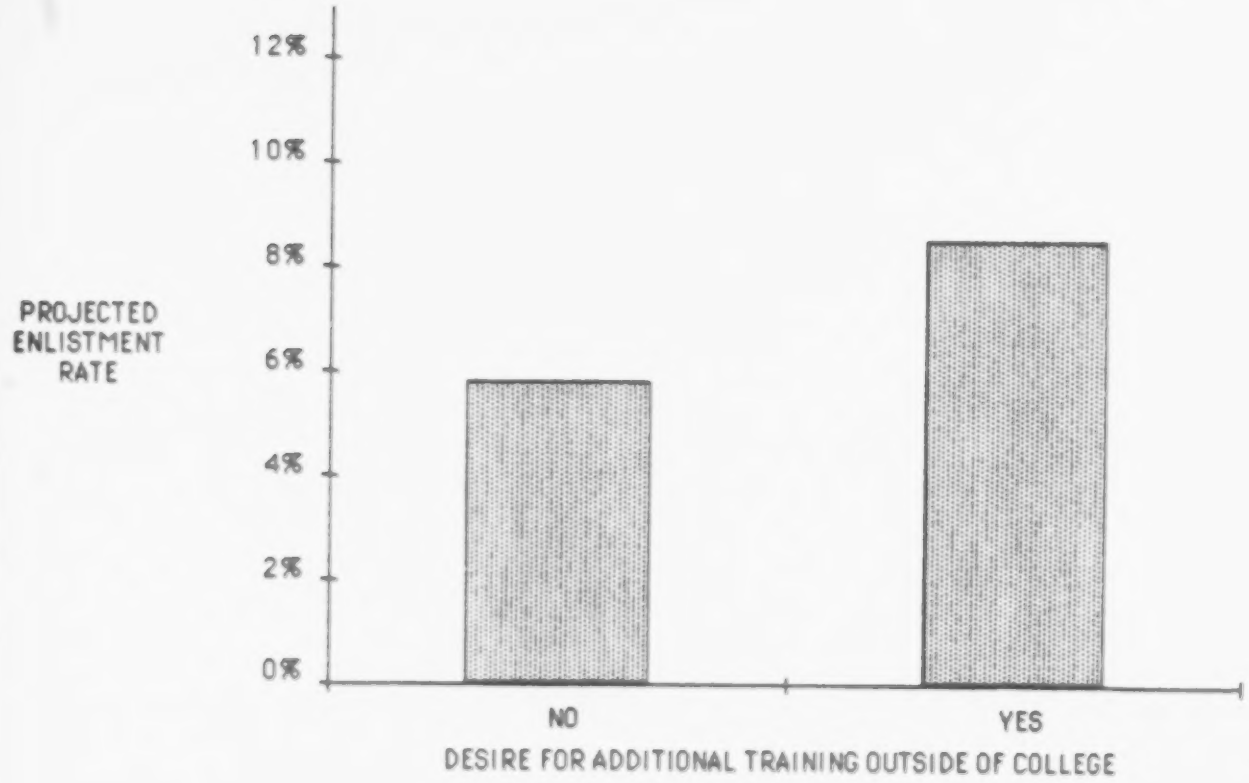
26



ARI (MPPRG)

PROJECTED ENLISTMENT RATE BY DESIRE FOR ADDITIONAL TRAINING, WHITE 17-YR-OLD HSDG MALES

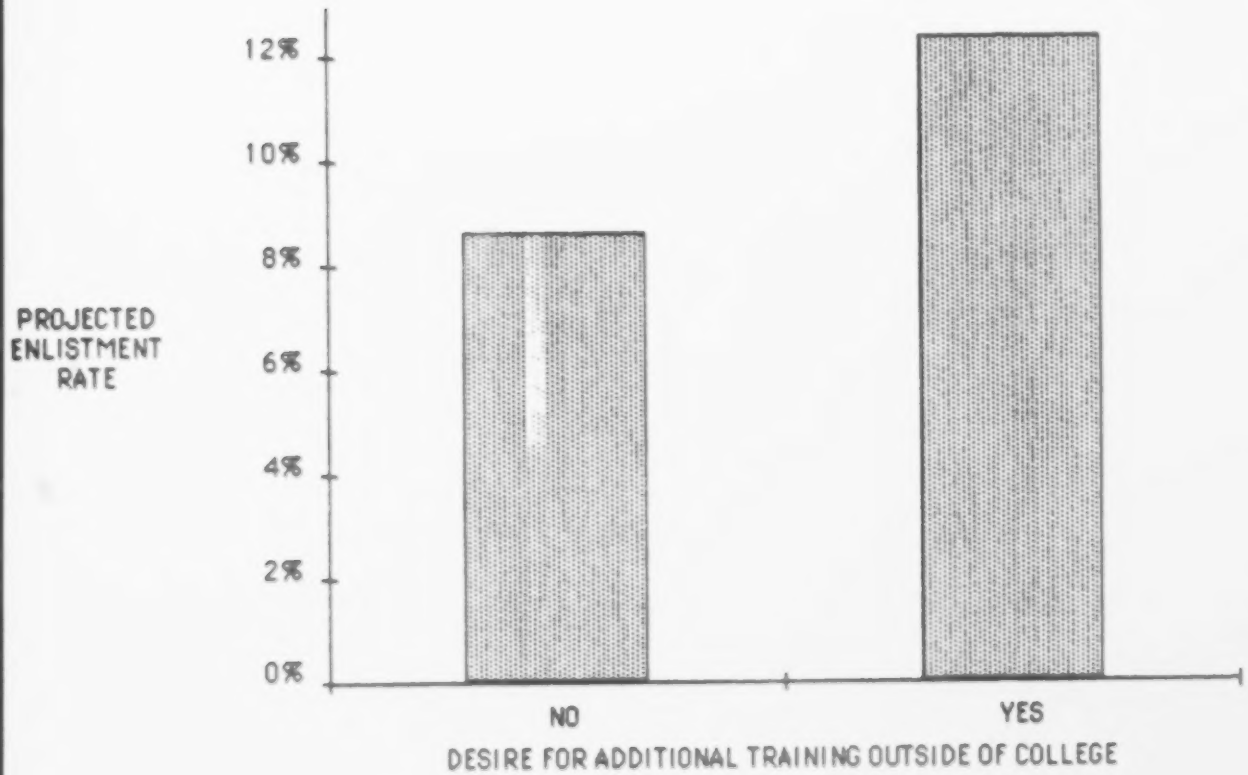
27



ARI(MPPRG)

PROJECTED ENLISTMENT RATE BY
DESIRE FOR ADDITIONAL TRAINING,
BLACK 17-YR-OLD HSDG MALES

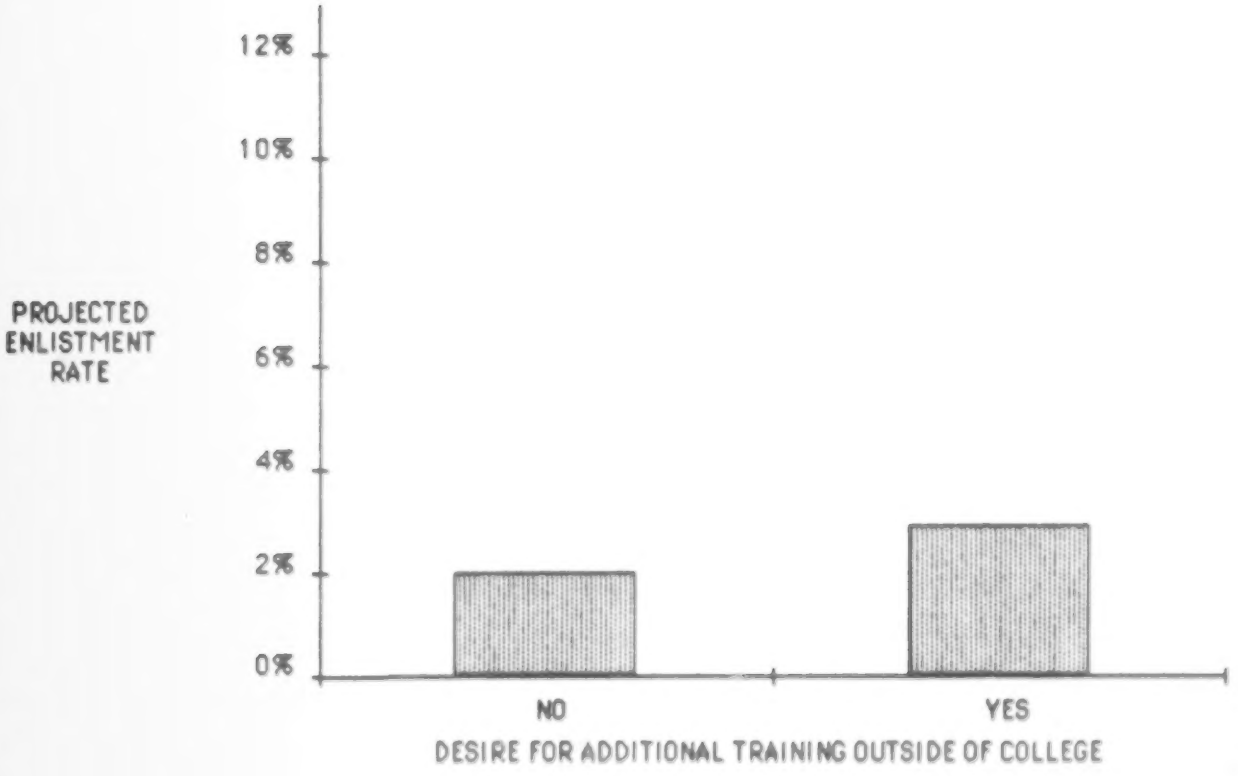
28



ARI(MPPRG)

PROJECTED ENLISTMENT RATE BY
DESIRE FOR ADDITIONAL TRAINING,
WHITE 17-YR-OLD HSDG FEMALES

29



ARI(MPPRG)

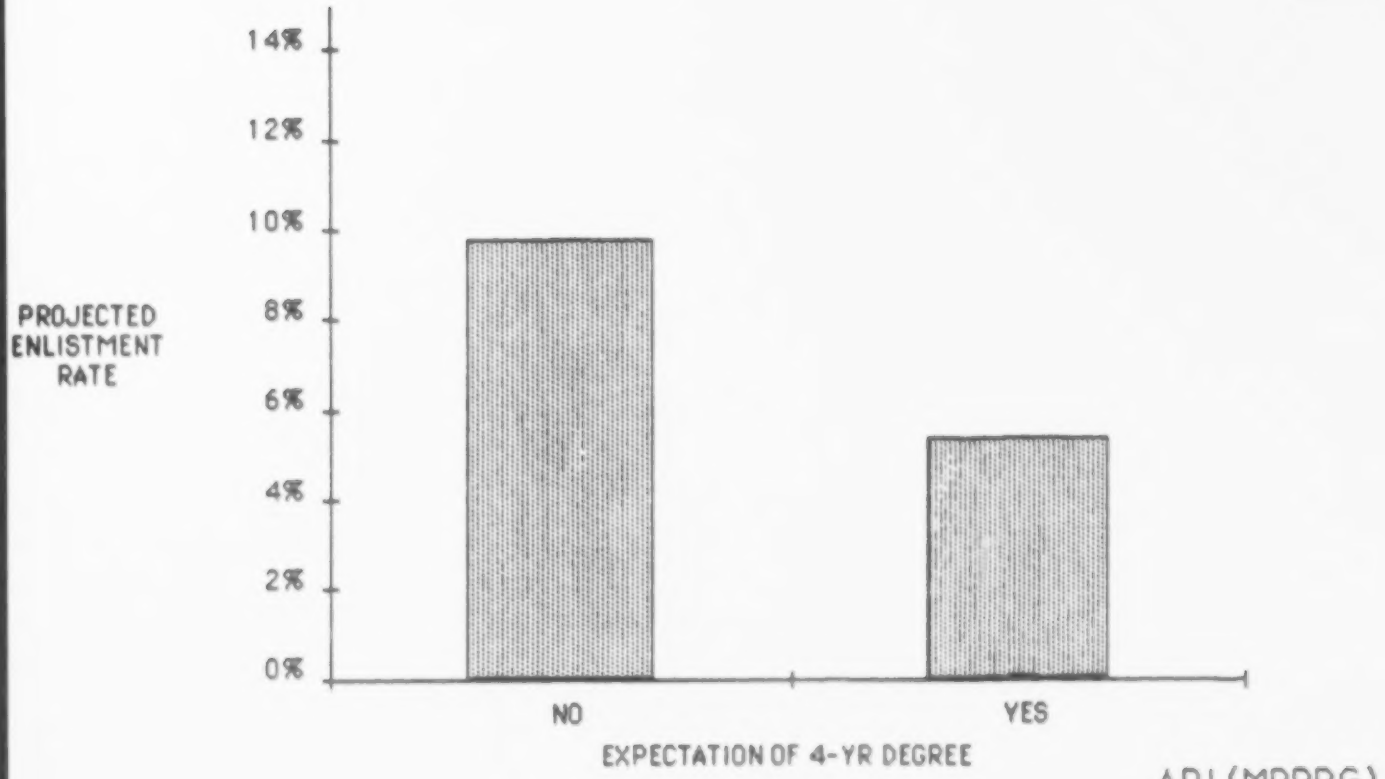
PROJECTED ENLISTMENT RATE BY
DESIRE FOR ADDITIONAL TRAINING,
BLACK 17-YR-OLD HSDG FEMALES

30

ARI(MPPRG)

PROJECTED ENLISTMENT RATE BY COLLEGE EXPECTATIONS, WHITE 17-YR-OLD HSDG MALES

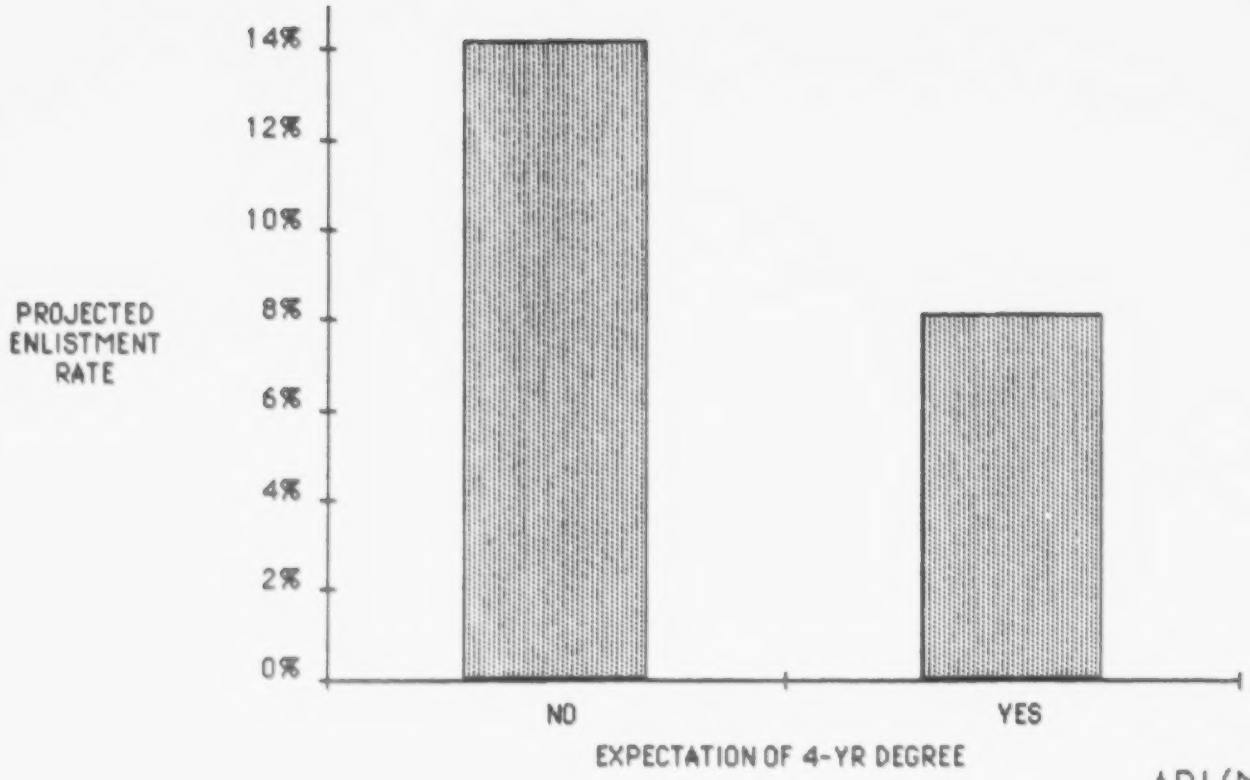
31



ARI (MPPRG)

PROJECTED ENLISTMENT RATE BY COLLEGE EXPECTATIONS, BLACK 17-YR-OLD HSDG MALES

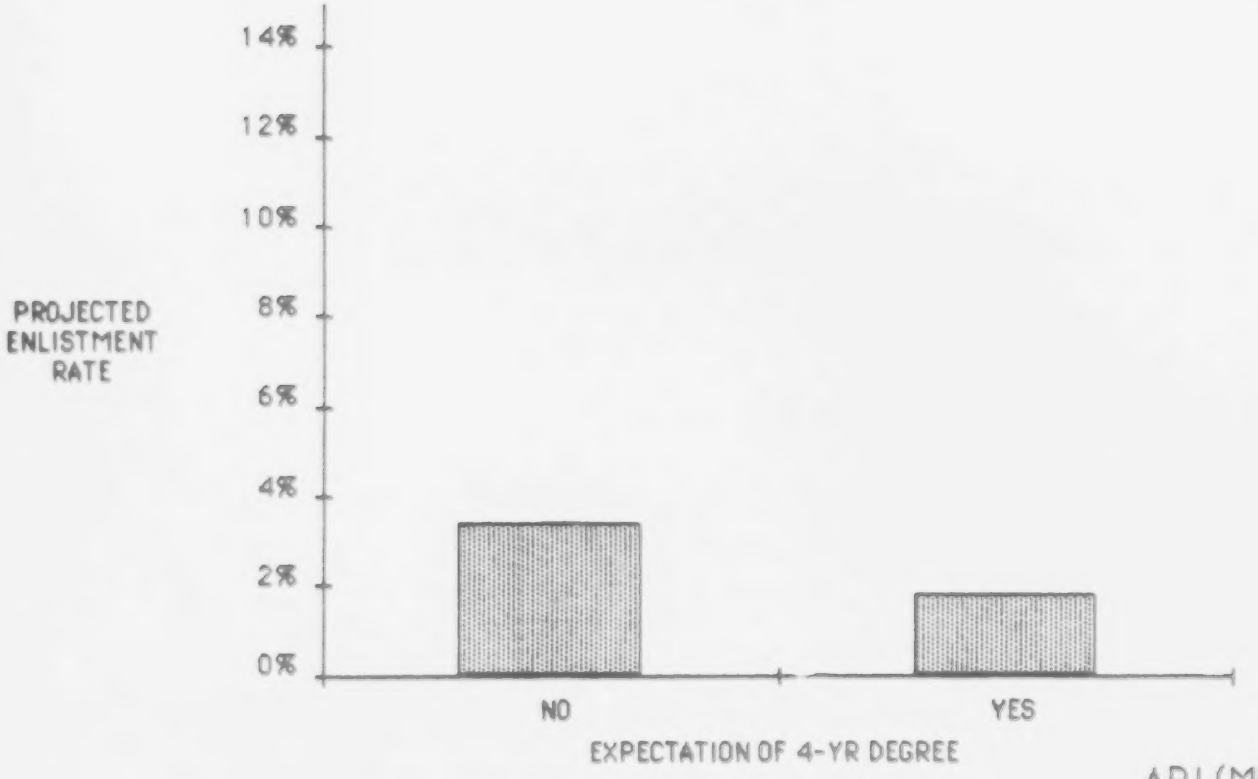
32



ARI (MPPRG)

PROJECTED ENLISTMENT RATE BY COLLEGE EXPECTATIONS, WHITE 17-YR-OLD HSDG FEMALES

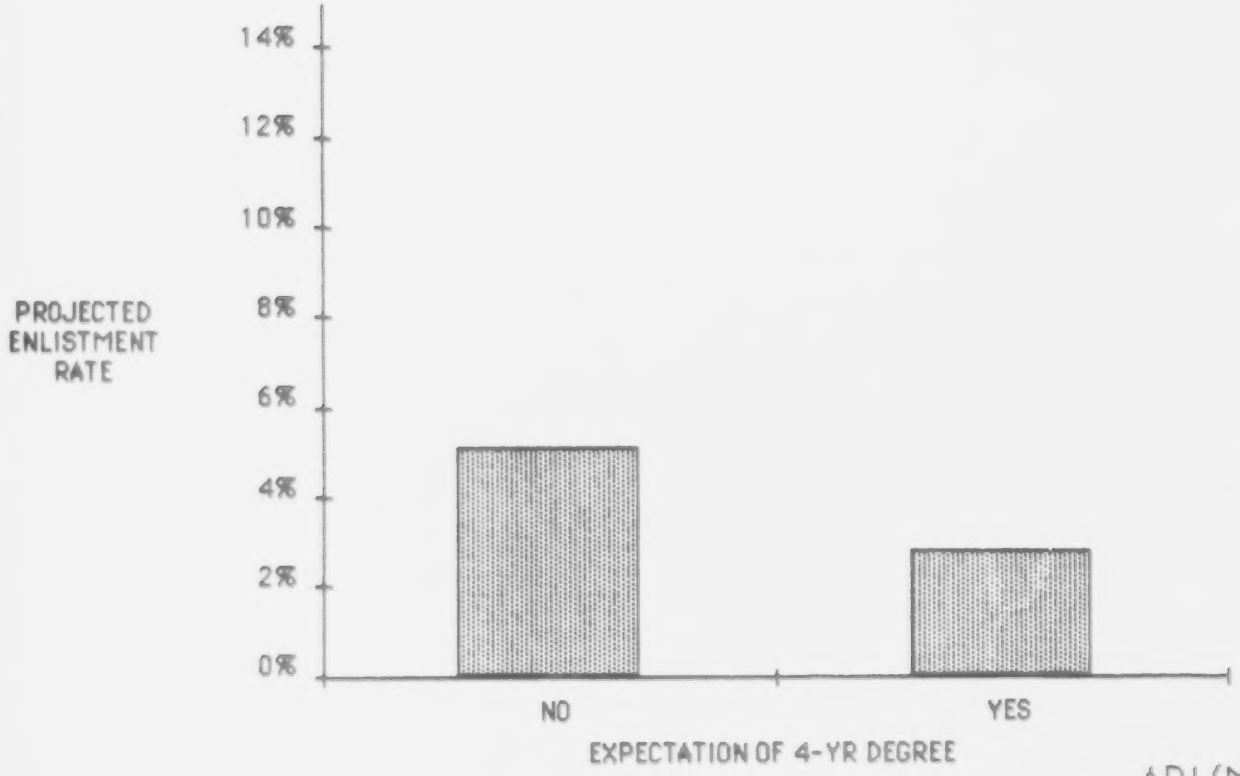
33



ARI (MPPRG)

PROJECTED ENLISTMENT RATE BY COLLEGE EXPECTATIONS, BLACK 17-YR-OLD HSDG FEMALES

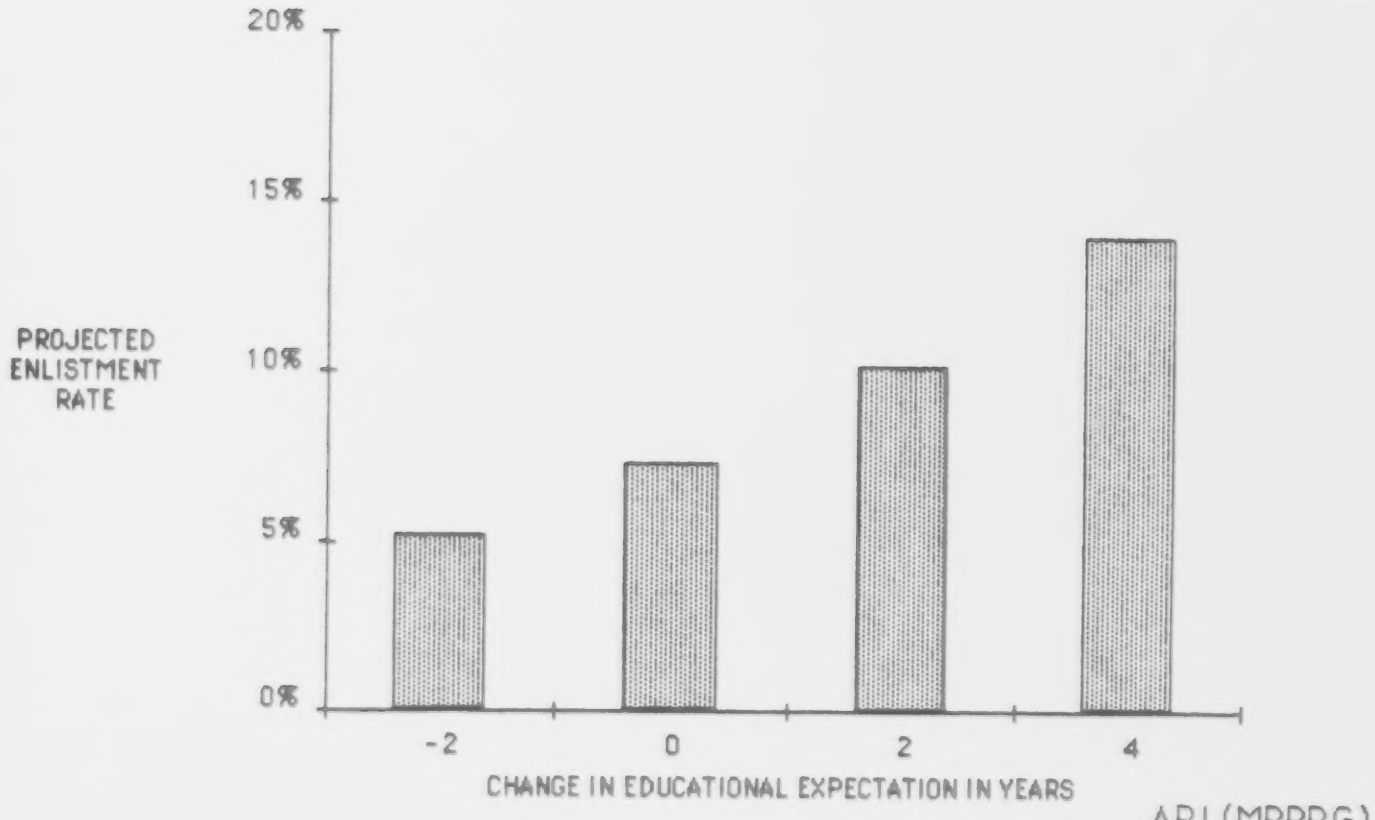
34



ARI (MPPRG)

PROJECTED ENLISTMENT RATE BY
CHANGE IN EDUCATIONAL EXPECTATION,
WHITE 17-YR-OLD HSDG MALES

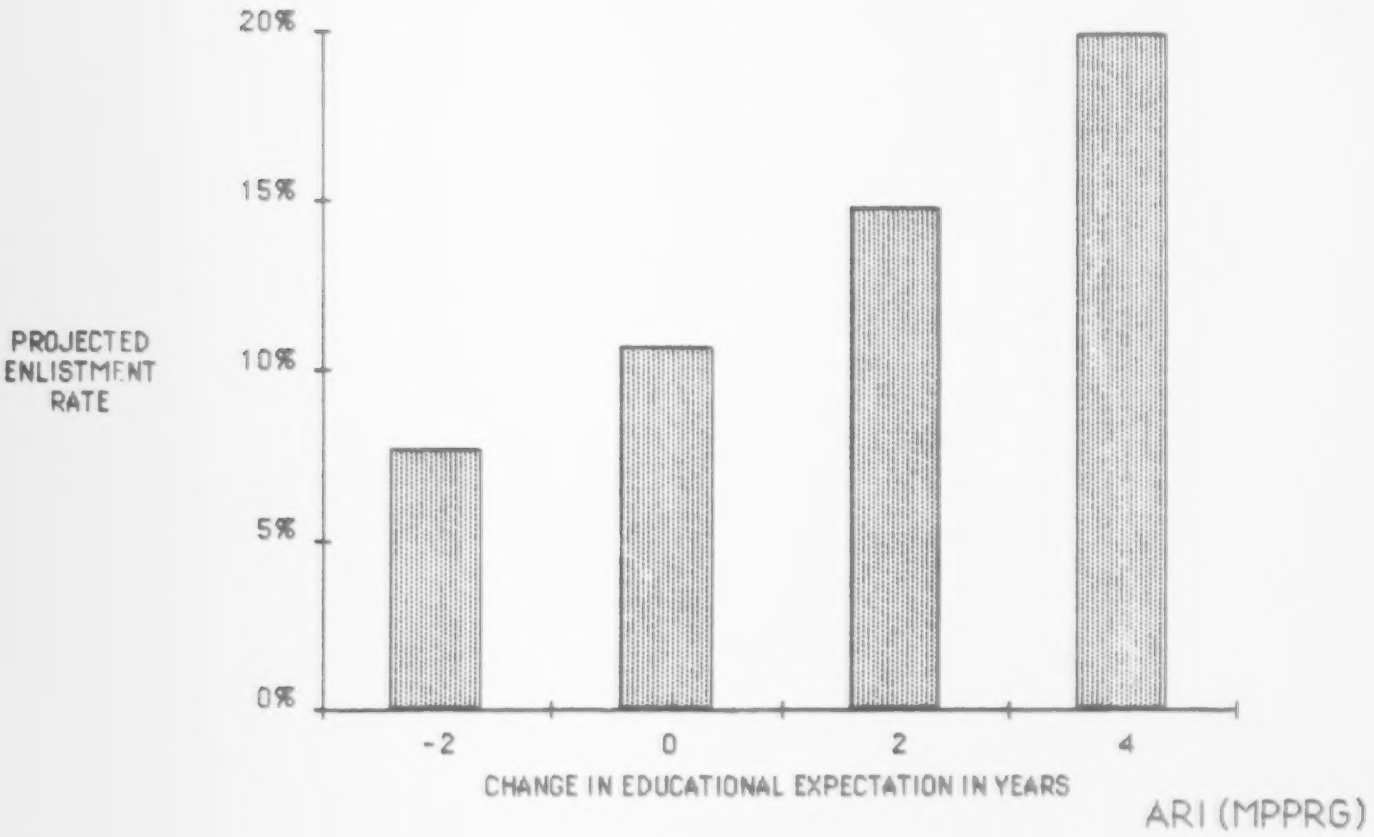
35



ARI (MPPRG)

PROJECTED ENLISTMENT RATE BY
CHANGE IN EDUCATIONAL EXPECTATION,
BLACK 17-YR-OLD HSDG MALES

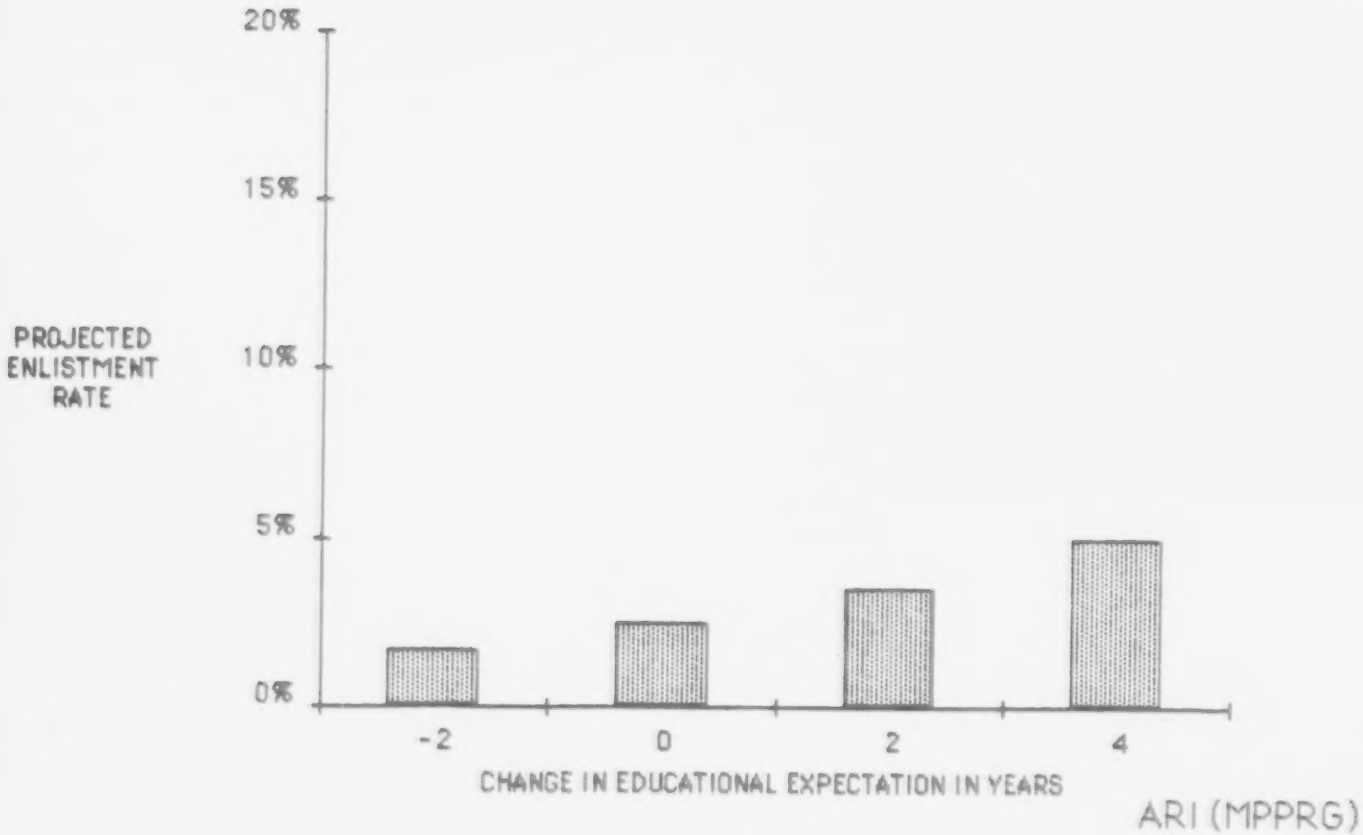
36



ARI (MPPRG)

PROJECTED ENLISTMENT RATE BY CHANGE IN EDUCATIONAL EXPECTATION, WHITE 17-YR-OLD HSDG FEMALES

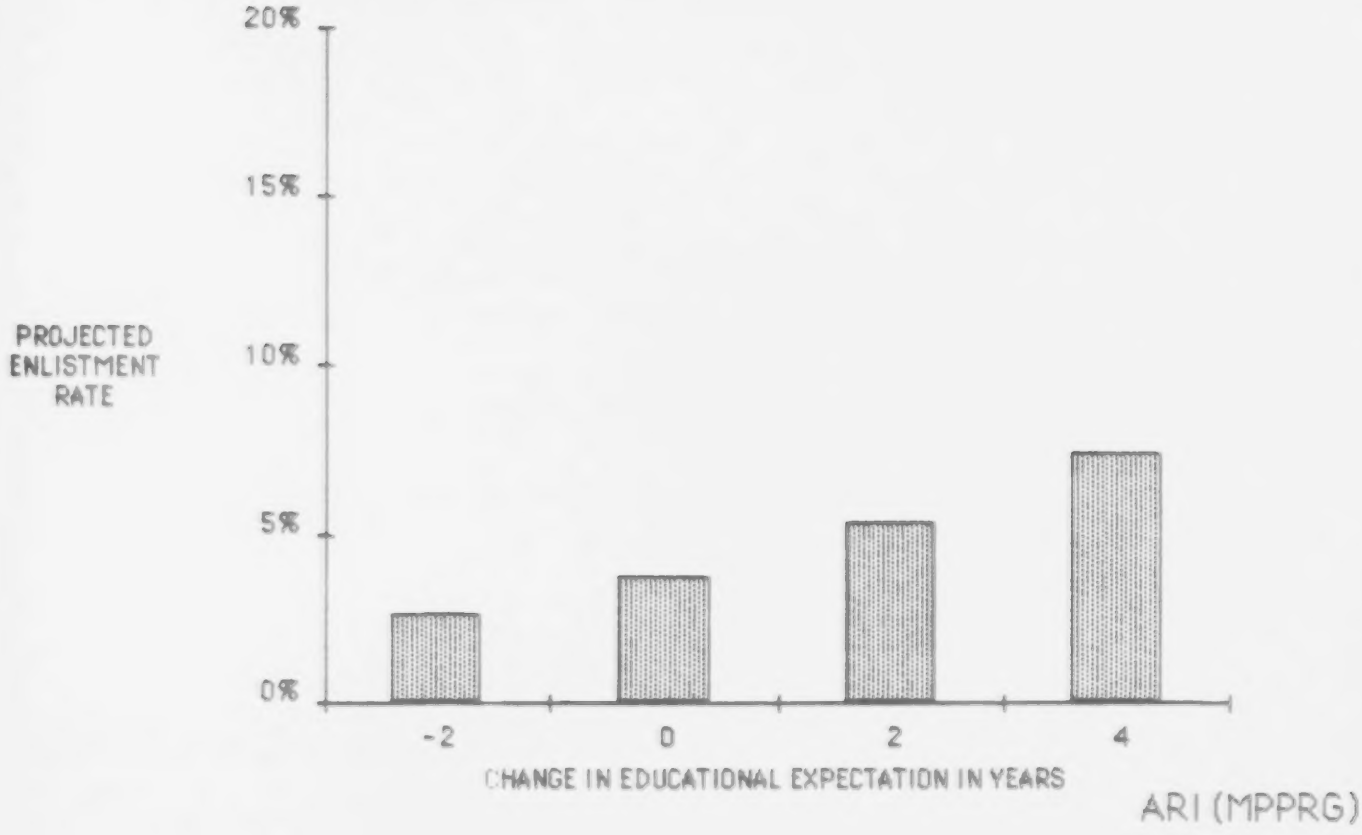
37



ARI (MPPRG)

PROJECTED ENLISTMENT RATE BY CHANGE IN EDUCATIONAL EXPECTATION, BLACK 17-YR-OLD HSDG FEMALES

38



ARI (MPPRG)

DISCUSSION

The analysis of propensity and enlistment behavior produced several new findings. Military enlistees experienced a substantial increase in educational expectations. Increased expectations may lead to enlistments, because the military is viewed as a mechanism to achieve education, or they may simply be correlated with the discussion of educational benefits that occurs with enlistment. If enlistment in the military raises educational expectations and achievement over what they would have been otherwise, military enlistment could lead to indirect social benefits.

There was also an interesting relationship between early enlistment intentions and the service actually joined. While most Air Force enlistees always intended to join the Air Force, most Navy recruits also intended to join the Air Force, and most Army accessions planned to serve in the Navy originally. This may reflect an enlistment hierarchy, where the Air Force is viewed as the most desirable service to join. In any case, there is substantial fluctuation among high school students as to their specific service intentions.

The multivariate model produced several new results:

- AFQT displayed a curvilinear relationship with enlistment rates.
- Positive movement in propensity was related to increased enlistment rates.
- Increasing educational expectations were associated with an increased likelihood of enlistment.

Previous research by Orvis and Gahart (1985) had found only a linear positive relationship between AFQT and enlistment rates for high school graduates. Our research indicates that this effect is curvilinear, with enlistment rates declining beyond an AFQT percentile of 55, even after controlling for propensity. Lower enlistment probabilities for those with AFQT scores between 11 and 30 may be biased somewhat low due to the limited requirements of the services for individuals in that range during late FY 82 through FY 83. However, this finding of curvilinearity is consistent with the hypothesis that labor market and educational opportunities, apart from simply propensity, affect enlistments.

The findings regarding the dynamic nature of propensity and educational expectations are perhaps the most significant results from this research. The fact that substantial movements in propensity occur and are associated with

similar changes in enlistment rates indicates that propensity is dynamic and could be influenced. Additional research is needed to determine the degree to which this finding reflects more accurate information in addition to simply shifts in propensity, however.

The positive relationship between educational expectations and enlistment may indicate the military is viewed as a positive mechanism for entering higher education. It would be interesting to investigate what sort of results would be obtained from a similar analysis, since most of the enlistees in our sample occurred prior to the introduction of the Army College Fund and the New G.I. Bill.

The results of this research provide some strong indications of where future enlistment modeling should proceed. Clearly, given the economic research, one should expect labor market conditions and family status and wealth to be significant factors. Certainly measurement specification problems need to be explored. In any case, this research would tend to support exploration along the lines of a simultaneous system model (model 1) over a recursive model (model 2). Other factors besides simply propensity appear to contribute substantially to the power of the model. Furthermore, such a model should include dynamic explanatory factors, since such variables have been found to contribute to the model's reliability.

REFERENCES

Amemiya, T. (1981). *Qualitative Response Models: A Survey.* Journal of Economic Literature, 19 (Dec.), 1483-1536.

Brown, C. (1985). *Military Enlistments: What Can We Learn From Geographic Variation?* American Economic Review, 75 (1), 228-234.

Center for Human Resource Research (1985). The Ohio State University, *Codebook, National Longitudinal Survey of Youth 14-22, 1979-1985.*

Center for Human Resource Research (1983). The Ohio State University, *The National Longitudinal Surveys Handbook 1985-1984.*

Cox, D.F. (1986). *Initial Occupational Choice: Military Service, Civilian Employment, or College*, Manpower and Personnel Policy Research Group, U.S. Army Research Institute, Forthcoming Technical Report, 1986

Kalwani, M.U. and Silk, A.J. (1982). *On the Reliability and Validity of Purchase Intention Measures.* Marketing Science, 1 (Summer), 243-285.

Morrison, D.G. (1979). *Purchase Intentions and Purchase Behavior.* Journal of Marketing, 43 (Spring), 65-74.

Nord, R.D., and Weiland, T.A. (1985). *Projected Youth Populations and Propensities to Enlist*, MPPRG Working Paper.

Orvis, B.R. (1982). *Forecasting Enlistment Actions From Intention Information: Validity and Improvement*, Rand Corporation, N-1954-MRAL.

Orvis B.R. and Gahart, M.T. (1985). *Relationship of Enlistment Intention and Market Survey Information to Enlistment in Active Duty Military Service*, Rand Corporation, N-2292-MIL.

APPENDIX A
NLS VARIABLES

The following variables were analyzed for possible inclusion in the propensity to enlist models (NLS variable reference numbers listed last):

- Expectation to enter the military/branch of the military
  431, 2357, 4238, 6711, 9128, 432, 2358, 4239, 6712, 9129
- Actual entry into the military/branch of the military
  291, 2412, 4293, 6770, 9187
- Sex
  8102, 10461
- Age
  6, 2202, 4105, 6501, 9001
- Parental education
  65, 79
- Parental occupation
  69, 83
- Ethnicity (primary, secondary, etc.)
  96, 97, 98, 99, 100
- Race
  1727, 3293
- Dependency on parents
  1503, 1551, 3117, 4822, 7817
- Marital Status
  116, 2260, 4136, 6561, 9012
- Type of last school attended
  196, 2295, 4177, 6648, 9062
- Currently attending HS
  186, 2294, 4176, 6647, 9061
- Pay and payperiod
  917, 918, 3389, 3390, 5466, 5467, 8410, 8411, 10882, 10883

- Desired and expected future schooling
  234, 235, 4196, 4197, 6667, 6668
- Incentives for enlistment (bonus)
  329, 2495, 4376, 6877, 9297
- Satisfaction with present income
  494, 2664, 4478, 7039
- Savings (binary variable)
  1688, 3277, 4982, 7983
- Talked to military/army recruiter
  412, 413, 2328, 2329, 4206, 4207, 6682, 6683, 9098, 9099
- Family income (Note: this particular variable, though promising, is unusable in its present form; perhaps the NLS contains some similar but better variables)
  4046, 6139, 8305, 10778
- Military history of the family
  9086, 9087, 9088, 9089, 9090
- Expectation of whether military or civilian sector provides more income
  2510, 2526, 4391, 4407, 6892, 6908, 9313, 9329
- AFQT percentile
  items 6147 through 6177
- Desire to acquire additional training
  From Cox dataset (see Cox, 1986)
- Local unemployment rates
  From Cox dataset (see Cox, 1986)